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Subcritical Flow at Open Channel Structures Bridge Constructions

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BRIDGE CONSTRICTIONS

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ABSTRACT

Subcritical Flow at Open Channel Structures
BRIDGE CONSTRICTIONS

The techniques previously employed by the writers for describing subcritical flow at open channel constrictions have been found valid for analyzing nonuniform flow in open channels. Combining the nonuniform flow analysis with the submerged flow ratings for various bridge geometries has provided an analytical means for determining the backwater due to the bridge constriction under "abnormal stage - discharge" conditions.

Skogerboe, Gaylord V., Lloyd H. Austin, and Kuan-Tao Chang.

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KEYWORDS - backwater, bridges, *energy losses, head loss, hydraulic design, *hydraulic structures, nonuniform flow, *open channel flow, subcritical flow.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES (Continued)

LIST OF FIGURES (Continued)

Figure **Page**

NOMENCLATURE

Symbol	Definition
A_1	area of flow including backwater at section 1
A_n	normal area at bridge site before the bridge is in place
A_{n1}	area of flow below normal water surface at section 1
A_{n2}	area of flow in constriction below normal water surface at section 2
A_p	flow area obstructed by piers
A_4	area of flow at section 4 at which normal water surface is reestablished
a	area of flow in a subsection of a channel
B	width of channel
b	width of constriction
b'	minimum width of jet = $b\, C_c$
C	Chezy resistance coefficient; or free flow discharge coefficient
C_c	coefficient of contraction
C_K	Kindsvater and Carter's discharge coefficient
C'_K	Kindsvater discharge coefficient for standard condition
E_1	specific energy at section 1
E_4	specific energy at section 4
E_d	specific energy at section downstream from constriction
E_u	specific energy at section upstream from constriction
E_r	ratio of E_d/E_u or E_4/E_1
E_{rt}	transition energy ratio
e	eccentricity of bridge centerline from channel centerline
F	Froude number
F_1	Froude number at section 1, $V/(gy_1)^{1/2}$

NOMENCLATURE (Continued)

Symbol	Definition
F_n	Froude number at normal depth, $V/(gy_n)^{1/2}$
f	Darcy-Weisbach friction factor
g	acceleration of gravity (32.2 ft./sec.^{2})
y_1^*	total backwater or rise above normal depth at section 1
h_L	head (energy) loss
J	ratio of area obstructed by piers to gross area of bridge waterway below normal water surface at section 2, A_p/A_{n2}
K^*	total backwater coefficient, $K_b + \Delta K_p + \Delta K_e + \Delta K_s$
K_b	backwater coefficient from base curve
ΔK_p	incremental backwater coefficient for piers
ΔK_e	incremental backwater coefficient for eccentricity
ΔK_s	incremental backwater coefficient for skew
L^*	distance from point of maximum backwater to water surface on upstream side of roadway embankment, measured parallel to centerline of stream
L_{1-2}	distance from point of maximum backwater to upstream face of bridge deck
L_{1-3}	distance from point of maximum backwater to water surface on downstream side of roadway embankment
L_{1-4}	distance from point of maximum backwater to reestablishment of normal water surface downstream, measured along centerline of stream
M	bridge opening ratio
m	contraction ratio [1 - M]
n	Manning roughness coefficient
n_1	exponent, in the free flow equation
n_2	submergence exponent in the denominator of the submerged flow equation

NOMENCLATURE (Continued)

Symbol	Definition
Q	total discharge, cfs
$Q_{h_L=1}$	value of Q when $h_L = 1$
R	hydraulic radius
S	submergence; ratio of a downstream flow depth to an upstream flow depth
S_e	slope of energy line
S_t	transition submergence
V	flow velocity
V_1	average velocity at section 1
V_4	average velocity at section 4
V_d	average velocity in channel downstream from constriction
V_{n2}	average velocity in constriction for flow at normal depth, Q/A_{n2}
V_u	average velocity in channel upstream from constriction
y	flow depth
y_1	flow depth at section I
y_3	flow depth at section III
y_4	flow depth at section IV
y_A	abnormal (nonuniform) stage at section II prior to placement of bridge constriction
y_c	critical depth
y_d	flow depth at a section downstream from constriction
y_n	normal flow depth
y_u	flow depth at a section upstream from constriction
σ	multiplication factor for influence of M on incremental backwater coefficient for piers
Φ	correlation coefficient between constriction and resistance backwater

INTRODUCTION

Importance

The importance of developing an understanding for the hydraulics of bridge constrictions is given by Bradley (1960):

> Structural designers are well aware of economies which can be attained in the structural design of a bridge of a given overall length. The role of hydraulics in establishing what the length and vertical clearance of a bridge should be and even where it should be placed is less well understood. Confining the flood water unduly may cause excessive backwater with resultant damage to upstream land and improvements and overtopping of the roadway or may induce excessive scour endangering the bridge itself. Too long a bridge may cost far more in added capital investment than can be justified by the benefits obtained. Somewhere in between is the design which will be the most economical to the public over a long period of years. Finding that design is the ultimate goal of the bridge designer.
>
> It is seldom economically feasible or necessary to bridge the entire width of a stream as it occurs at flood flow. Where conditions permit, approach embankments are extended out onto the flood plain to reduce costs, recognizing that, in so doing, the embankments will constrict the flow of the stream during flood stages. This is an acceptable practice. When carried to extremes, however, constriction of the flow can result in damage to bridges, costly maintenance, backwater damage suits, or even contribute to the complete loss of the bridge or the approach embankments.

Izzard (1955) has discussed the relative accuracy required by highway engineers in estimating the amount of backwater that can be expected at any particular bridge constriction:

> The following distinction between the objectives of the hydrologic engineer and those of the highway designer is important. The former is expected to achieve a fairly high standard of accuracy in his estimate of the flood discharge as computed from backwater, and that estimate is the end result. The highway engineer, however, reverses the computation and wants to know approximately how much backwater can be expected for floods of various frequencies whose peak discharge can probably be estimated no more accurately than plus or minus 20

percent (unless a gaging station having a long record happens to exist nearby). Obviously, then, the highway engineer does not have to work to the close tolerances expected of the engineer who is gaging streams.

Izzard's point is significant when considering model studies to predict prototype behavior. The hydraulic analysis of a model bridge constriction in the laboratory would be expected to have an accuracy within 5 percent. If the model hydraulic analysis is used to predict the hydraulic performance of a prototype structure, the prediction error will be more than 5 percent. In fact, it is not at all inconceivable that the accuracy in predicting the prototype discharge may be only within 20 percent.

Bridges are usually constructed so that the abutments constrict the river channel. Ofttimes, piers are used which also constrict the river. The effect of constricting the river channel is to raise the water surface upstream from the bridge, while at the same time the flow through the bridge constriction is accelerated. The backwater (y_1*) is defined as the maximum water surface difference occurring upstream from the bridge at design flood discharge between the normal water surface in the river prior to construction of the bridge and the water surface profile after construction of the bridge. The backwater occurs a short distance upstream from the bridge, but the backwater curve may extend upstream for miles. The accelerating flow through the constriction results in higher velocities and greater turbulence, with a consequent increased potential for scouring the stream bed. The analysis of flow conditions wherein scour is taking place becomes extremely complex.

The usual analysis of backwater at bridge constrictions requires a knowledge of the boundary resistance and bed slope of the river channel in order that the normal flow depth can be computed from Manning's or Chezy's equation for the design flood discharge. If uniform flow does actually occur in the vicinity of the bridge site, then a unique stage-discharge relation exists at the bridge site. The hydraulic characteristics of the proposed bridge design are then superimposed upon the river flow conditions to arrive at the backwater which would be caused by construction of the bridge.

If nonuniform flow exists in the reach at the bridge site, then a unique stage-discharge relation does not exist. Instead, stage-fall-discharge relations are used to describe flow conditions in the river. Since normal (uniform) flow does not exist, the term "abnormal stage-discharge conditions" has been applied to this phenomena. Nonuniform flow at the bridge site is due to downstream control, examples of which might include flood conditions at the confluence of two streams, downstream reservoir or spillway regulation, influence of tides, or changes in vegetative or moss conditions in flat gradient channels. Abnormal stage-discharge conditions complicate the analysis of backwater due to bridge constrictions, as evidenced by statements of Bradley (1960):

> Estimating the design stage at a bridge site under abnormal conditions can be a complicated process requiring much individual judgement; thus the approach to the computation of backwater in this case has been treated strictly as an approximate solution. This is a case

where it is more important to understand the problem than to attempt precise computations.

In a preliminary report by the American Society of Civil Engineers (ASCE) (1966), 12 recommendations were presented regarding needed research on the hydraulics of bridged waterways. One of the recommendations stated that it may be possible to derive experimental data which would simplify the procedure for analyzing backwater due to bridge constrictions under abnormal stage-discharge conditions.

Background

The work reported herein represents a portion of the second phase of a research project involving subcritical (submerged) flow analysis at open channel constrictions. Both phases of this project have been supported by the Office of Water Resources Research (OWRR). A method of analyzing submerged (subcritical) flow was first developed for a trapezoidal flume by Hyatt (1965). Later studies verified the method of analysis for a rectangular flume (Skogerboe, Walker, and Robinson, 1965) and weirs (Skogerboe, Hyatt, and Austin, 1967). Because of these findings, along with limited analysis of data reported by other investigators, the writers were encouraged to extend the subcritical flow analysis to the so-called "abnormal stage-discharge condition" at bridge constrictions.

The original development of the parameters and relationships which describe the submerged flow condition came from a combination of dimensional analysis and empiricism. Further verification of the parameters developed in this manner was obtained by employing momentum relationships. This method of analysis can be applied directly in developing a stage-discharge relationship for each bridge constriction studied in the laboratory. In order to describe the backwater at such constrictions, it becomes necessary to incorporate an analysis of flow resistance in the main channel. Thus, the channel flow resistance must be related to the subcritical flow rating of the bridge constriction in order to compute the backwater caused by the bridge being placed in the river channel.

Many studies have been reported in the literature regarding the hydraulics of bridge constrictions. Most of the research has involved laboratory studies using a tilting flume. Typically, the tilting flume is placed at a particular slope, a certain value of discharge is set, and normal flow is established. Then, a bridge constriction is placed in the flume and measurements are made of flow depths upstream from the model bridge, through the bridge constriction, and downstream from the constriction. From these water surface profile measurements, the maximum backwater can be determined. The procedure is continued using a series of discharge values and then changing the flume bed slope until the desired number of slopes have also been investigated.

Unfortunately, only limited studies have been made to establish the backwater when downstream control exists. In laboratory studies, backwater effects under subcritical flow conditions (downstream control) could be established by adding another dimension to the typical studies described above. Namely, for each value of bed slope and discharge, the tailwater depth would have to be varied.

Purpose

The intent of this research effort was to develop a method of backwater analysis for bridge constrictions when abnormal stage-discharge conditions exist. The use of the term "abnormal" is somewhat unfortunate since this refers to subcritical flow existing at the bridge constriction, as well as upstream and downstream from the constriction. The subcritical flow techniques previously developed at Utah State University for flow measuring flumes and weirs can be applied in describing subcritical flow at bridge constrictions. The subcritical flow analysis was combined with the flow resistance analysis of the main channel without a constriction in order to arrive at the backwater analysis. Through laboratory studies, data were generated for a few geometrical forms of bridge constrictions, thereby allowing the development of a design methodology, or design criteria, for bridge constrictions operating under subcritical flow conditions throughout the structure.

LITERATURE REVIEW

Some of the early investigators of open channel flow through contractions, as well as backwater due to contractions and/or bridge piers, were Nagler (1918), Lane (1920), Rehbock (1921), and Yarnell (1934a, 1934b). This same subject material was further investigated by Kindsvater, Carter, and Tracy (1953), Kindsvater and Carter (1955), Tracy and Carter (1955), Liu, Bradley, and Plate (1957), and Biery and Delleur (1962).

Flow Characteristics

The flow characteristics at bridge constrictions have been described by Kindsvater and Carter (1955), Liu, Bradley, and Plate (1957), and by the Task Committee on Hydraulics of Bridges of ASCE (1966). The following material has been extracted primarily from these sources.

A channel constriction may be defined as a local change in cross-section which produces a variation in flow. An open channel constriction, such as a highway bridge crossing, is an example of a transition of this type. The flow through such constrictions is most often in the tranquil range, and produces gradually varied channel flow far upstream and downstream, although rapidly varied flow occurs at the constriction. The effect of the constriction on the water surface profile, both upstream and downstream, is conveniently measured with respect to the normal water surface profile, which is the water surface in the absence of the constriction under uniform flow conditions. Upstream from the constriction, an M1 backwater profile occurs. In this region, the velocities, and consequently the rate of loss of flow energy, are less than for normal flow conditions. The backwater effect may extend for a considerable distance in the upstream direction. At some upstream point, the constricted and the normal water surface profiles practically coincide as shown at section 0 in Fig. 1.

Near the constriction (Fig. 1), the central body of water begins to be accelerated at section I, whereas deceleration occurs along the outer boundaries, and a separation zone (zone Ia) is formed in the corners upstream from the constriction. At the constriction, as the flow is accelerated, the water surface profile falls rapidly between sections II and III, and the jet stream contracts to a width somewhat less than the width of the opening. The spaces between the jet and the constriction boundaries are occupied by eddying water (zone IIIa). Immediately downstream from the constriction, the expansion process begins and continues until the normal regime of flow has been reestablished in the full-width channel downstream. At that point, the normal and constricted profiles again coincide as shown at section IV. The downstream reach between sections III and IV is one of decelerated flow in which the average velocities and energy losses are greater than for the normal case because of the additional turbulent mixing resulting from the expansion process. In the whole backwater reach (the reach between the two points at which the normal and constricted profiles coincide, which is the reach between sections 0 and IV) the total energy loss is the same as that for normal flow.

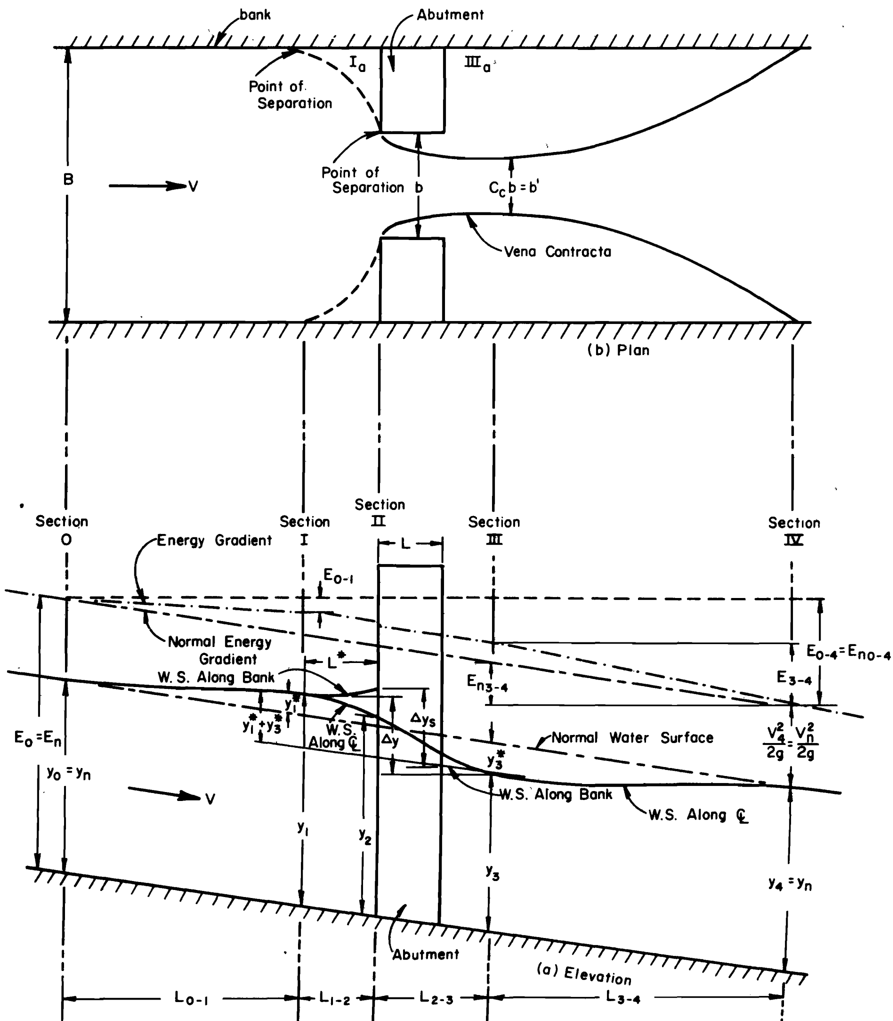

Figure 1. Definition sketch of simple vertical board constriction.

The effect of the constriction is to cause a redistribution of the energy of the flow system over the backwater reach between sections 0 and IV. At the constriction, the available energy is greater than the frictional resistance under normal flow conditions by an amount required for the increased losses in the downstream reach. The increase in energy is a result of smaller boundary drag loss (as compared with normal uniform flow conditions) upstream from the constriction. In the downstream reach, the increased energy losses when compared with frictional resistance under normal flow conditions, are due primarily to the increased turbulent mixing caused by the diffusion of the jet as it expands from section III to section IV. These energy losses are a function of discharge, contraction ratio, and constriction geometry. Therefore, these losses may be decreased by a decrease in discharge, a smaller contraction ratio, or by streamlining the abutment and constriction geometry to more nearly allow the jet to occupy the full width of the constricted opening. In general, the same statement is applicable to the backwater caused by the constriction.

Methods of Approach

Although it may be desirable in some cases to predict the complete longitudinal profile of the constricted flow throughout the backwater reach, the highway engineer is usually concerned with the maximum upstream water surface change produced by the constriction, and it is to the definition of this latter quantity that the greater part of the backwater studies to date have been devoted. Thus far, general approaches to the problem are found in the literature. The first is a routing procedure based on the equations of continuity, momentum, and energy. Another approach follows from laboratory measurements upon model structures, which is the technique employed by the writers on the research reported herein. Consequently, the literature review has been limited to studies using model structures.

The use of laboratory model studies has yielded a more direct attack on the backwater problem than the routing procedure. These studies have had as their objective the measurement and subsequent generalization of the maximum upstream difference between the normal and the constricted longitudinal water surface profiles, which usually occurs a short distance upstream from the constriction. Considerable attention has been directed, also, to the influence of piers and piling placed in the constricted section as supports for bridge structures at highway crossings.

Laboratory Model Studies

Early investigations by Nagler (1918), Lane (1920), and Yarnell (1934a, 1934b) were concerned with developing coefficients for constriction discharge formulas proposed by d'Aubuisson and Weisbach. In addition, Yarnell was concerned with the work reported by Rehbock (1921). Nagler and Yarnell studied the backwater effects of bridge piers and pile trestles, while Lane was concerned with constricting the sides of the channel, as would be the case for many bridge abutments. Limitations in experimental design, along with certain assumptions made in the analyses, produced little information of a general nature.

Yarnell (1934b) compared Rehbock's flow classification system involving three flow classes with a two-class system used by Yarnell (Fig. 2). The system

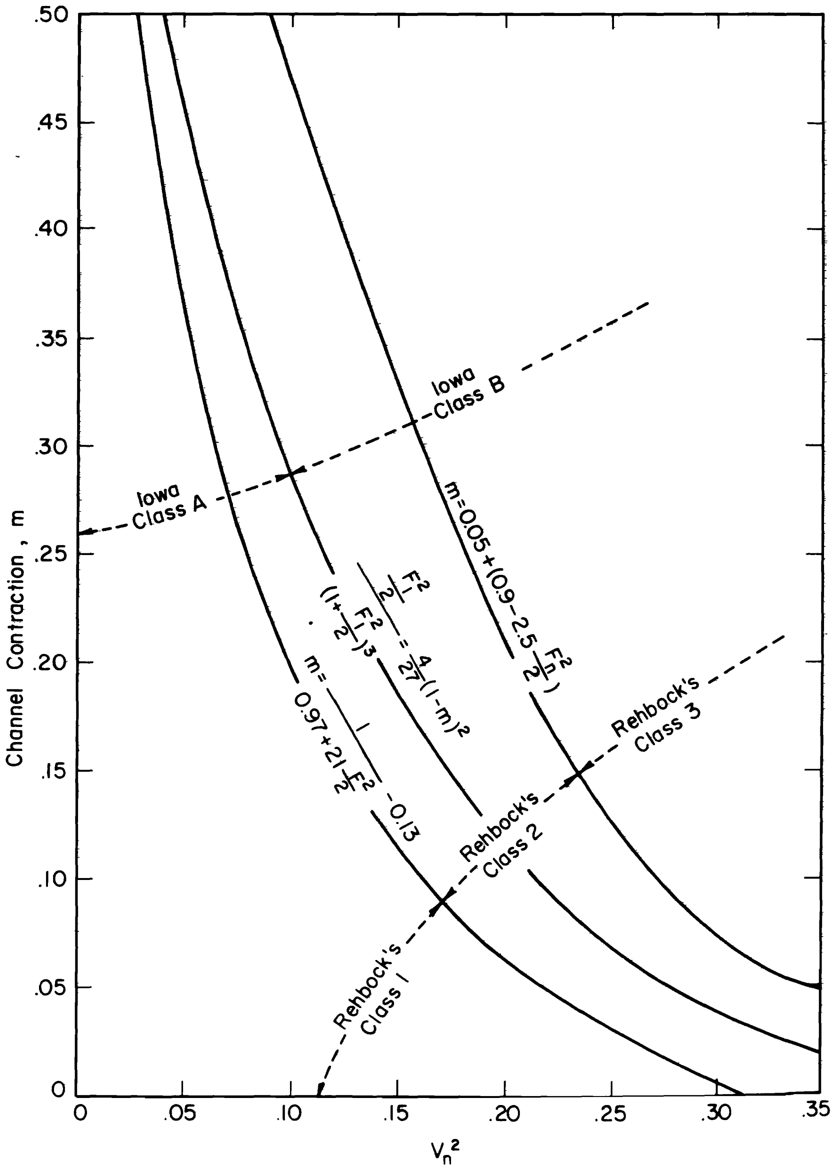

Figure 2. Classification by Rehbock and Yarnell for flow through a contracted opening. (Taken from Yarnell, 1934b.)

used by Rehbock (1921) is strictly empirical, whereas Yarnell's system has physical meaning. For example, the classification "Iowa Class B" is for the situation wherein critical depth occurs in the constriction, whereas "Iowa Class A" indicates that the flow throughout the constriction is tranquil, or subcritical (flow depth is everywhere greater than critical depth). The backwater that occurs under critical depth conditions is referred to as "contraction backwater," whereas the backwater that occurs when subcritical flow exists in the constriction is called "resistance backwater." Contraction backwater is not affected by downstream conditions. The resistance backwater is primarily a function of the energy losses occurring in the flow expansion downstream from the constriction.

Contraction backwater is the easiest case to analyze, since critical depth occurs in the constriction. Normally, supercritical flow conditions at a bridge would be avoided, because a hydraulic jump would occur downstream from the bridge and the potential for considerable scouring of the river bed would exist, thereby possibly endangering the safety of the bridge if the abutment and/or pier foundations have been constructed in the river bed.

The most common situation encountered at bridge constrictions is tranquil flow. Investigations in recent years regarding backwater at bridges have been concerned mostly with superimposing a constriction upon normal (uniform) flow occurring in an open channel.

Kindsvater and Carter (1955) studied the hydraulics of bridge constrictions in the laboratory at Georgia Institute of Technology using a horizontal steel flume 18 inches deep, 10 feet wide and 21 feet long. From laboratory investigations, a method of estimating the discharge through a contracted section was proposed. A combination of an energy equation and continuity equation (from Fig. 1) results in the discharge equation

$$Q = C_K b y_3 \sqrt{2g[(y_1 - y_3) - E_f + \alpha_1 V_1^2/2g]} \quad \ldots \quad (1)$$

in which

Q = discharge in cfs;
C_K = Kindsvater's discharge coefficient;
b = width of the contracted opening;
y_1 = flow depth at section I;
y_3 = flow depth at section III;
g = gravitational acceleration;
$\frac{\alpha_1 V_1^2}{2g}$ = weighted average velocity head in feet at section I, where V_1 is the average velocity at section I, and α_1 is a coefficient which takes into account the variation in velocity in section I; and
E_f = the head loss in feet due to friction between sections I and III.

By the aid of dimensional analysis, the discharge coefficient is found to be a function of the following variables

$$C_K = f\left[F, m, \frac{y_3}{b}, \frac{L}{b}, e, \phi, \text{abutment type}\right] \quad . . (2)$$

in which

$$F = \frac{Q}{by_3\sqrt{gy_3}} \quad . . . . (3)$$

which is a Froude number

m	=	1 - b/B, which is called the contraction ratio;
L	=	length equivalent to the contracted opening in the flow direction;
e	=	eccentricity of the opening;
ϕ	=	skew angle of the abutment with respect to the flow.

In case of an irregular, natural channel, the contraction ratio m can be evaluated from

$$m = 1 - \frac{K_b}{K_B} \quad . . . . (4)$$

in which K_b is the conveyance of that part of the approach channel which occupies an area of width b, and K_B is the conveyance of the total section. Conveyance is defined in terms of the Manning formula as

$$K = \frac{1.49}{n} AR^{2/3} \quad . . . . (5)$$

in which A is the area, R is the hydraulic radius, and n is the Manning's roughness factor.

By ignoring the ratio y_3/b, in Eq. 2, which was shown by experiment to be insignificant, Kindsvater and Carter defined a standard condition such that F = 0.5, e = 1, $\phi = 0^\circ$ with the abutment type vertical-faced with square-edges. From the experimental data for the standard condition, a family of base curves showing the relationship between C_K, m, and L/b was constructed (Fig. 3). If the discharge coefficient for the standard condition is designated as C_K', the value of C_K' should be adjusted for the effects of F, e, ϕ and abutment type. Such an adjustment value of discharge coefficient can be substituted into Eq. 1 for computing the discharge. A set of figures for the adjustment of C_K' is given in Fig. 3 for a simple vertical board (type I) constriction.

To apply this method for computing discharge, the stages of the flow in the vicinity of the constriction must be obtained from field measurements, in addition to such information as contraction ratio and abutment geometry. This process of computing the discharge is opposite to the one of computing the maximum backwater. In the later case, the stages of the flow in the vicinity of the constriction are unknown, but the discharge, which is a design discharge for a certain flood frequency, is always given. In Eq. 1, if Q and b are known and if C_K can be estimated, the remainder of the terms which represent the flow stages

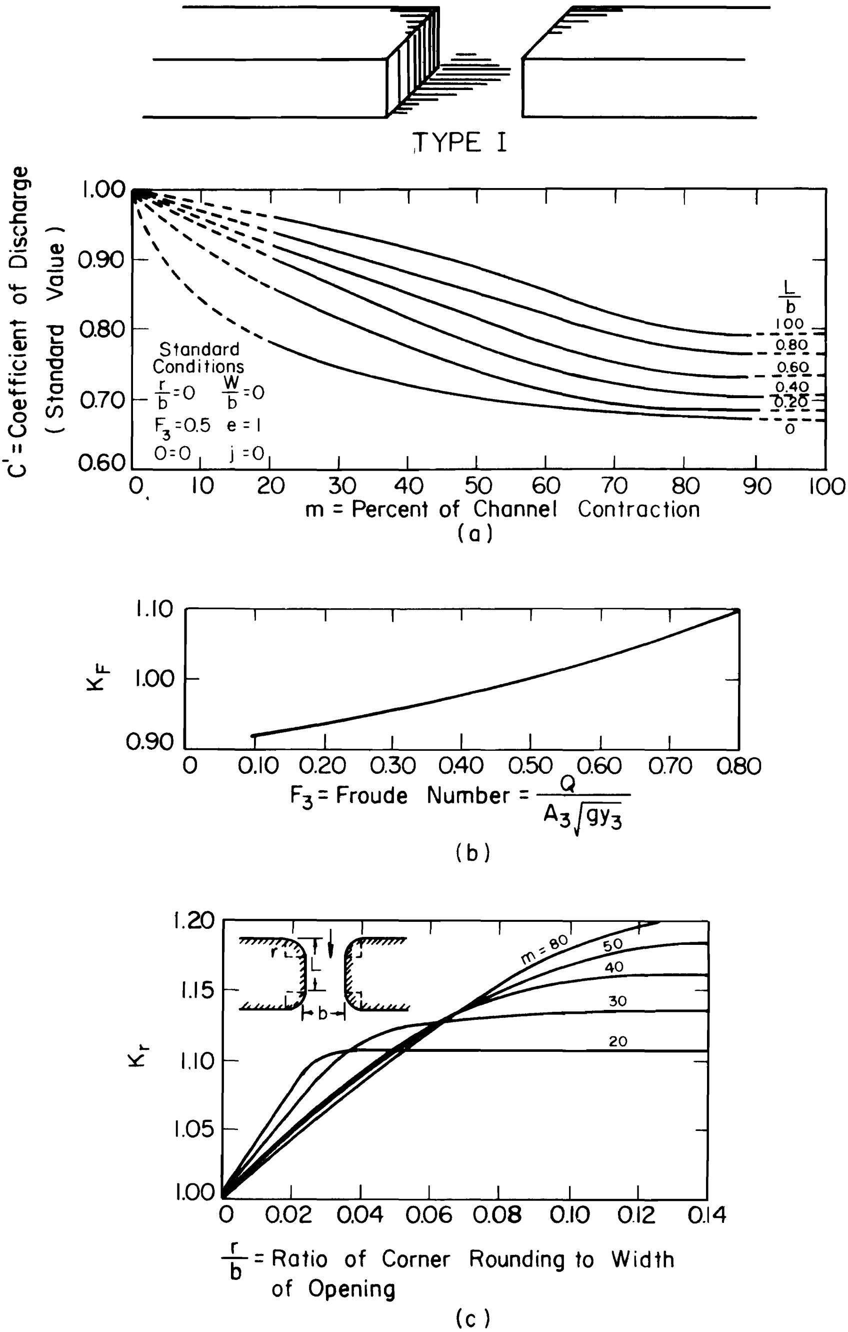

Figure 3. Discharge coefficient for constriction of type I opening, vertical embankments and vertical abutments. (a) Base curve for coefficients of discharge; (b) variation of discharge coefficient with Froude number; (c) variation of discharge coefficient with entrance rounding.

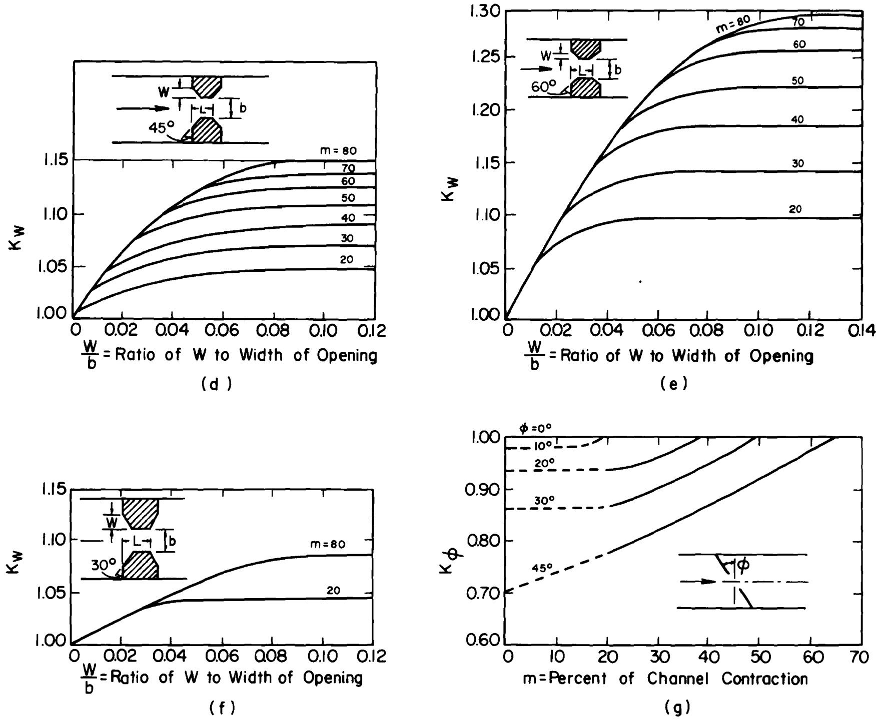

Figure 3. (Continued) (d) Variation of discharge coefficient with length of 45° wingwalls or chamfers; (e) variation of discharge coefficient with length of 60° wingwalls; (f) variation of discharge coefficient with length of 30° wingwalls; (g) variation of discharge coefficient with angularity. (Taken from Kindsvater, Carter, and Tracy, 1953.)

can be expressed as a function of the discharge and the discharge coefficient. Thus, a laboratory investigation intended for determining the discharge characteristics for an open-channel constriction can be adopted to determine the maximum backwater as well, or vice versa (Liu, Bradley, and Plate, 1957).

By extending the investigation of Kindsvater and Carter (1955), Tracy and Carter (1955) developed a method for computing the maximum backwater. The maximum backwater, $y_1{}^*$ measured upstream from the constriction inlet at a distance, b, can be divided by Δy, which is the difference in water surface elevation between section I and section III for the constricted channel as shown in Fig. 1. The ratio $y_1{}^*/\Delta y$, according to Tracy and Carter, has been shown by laboratory data to be a function primarily of the percentage of channel contraction. The influences of bed roughness and constriction geometry are secondary. Variables characteristic of the flow, such as the Froude number, depth, and constriction length are largely unimportant in their effect on this ratio. The variation of the dimensionless backwater ratio, $[y_1^*/\Delta y]_{base}$, with the contraction ratio m, and the Manning's roughness factor n, is shown in Fig. 4, in which $[y_1^*/\Delta y]_{base}$ is the ratio $y_1^*/\Delta y$ for a channel having a vertical-faced constriction with square-edged abutments (simple vertical board model).

Letting

$$K_c = \frac{y_1^*/\Delta y}{[y_1^*/\Delta h]_{base}} \quad \ldots\ldots\ldots \quad (6)$$

in which $y_1^*/\Delta y$ is for any type of abutments, it was found that K_c varies with the contraction ratio and the ratio of existing discharge coefficient C_K to the discharge coefficient C_K' for the base condition (Fig. 4). The discharge coefficient C_K is Kindsvater's discharge coefficient which was mentioned previously.

Tracy and Carter claimed that the quantity Δy can be computed from

$$\Delta y = \frac{Q^2}{2gb^2 y_3^2 C_K^2} - \alpha_1 \frac{V_1^2}{2g} + E_f \quad \ldots \quad (7)$$

In application, $y_1^*/\Delta y$ is selected from Fig. 4. The ratio $y_1^*/\Delta y$ is then adjusted for a constriction-geometry effect by the factor K_c obtained from Fig. 5. The adjusted ratio $y_1^*/\Delta y$ may be multiplied by Δy to yield the value of y_1^*.

The data used by Tracy and Carter were obtained in a channel having a level bottom. The difficulty of using the data from a level channel is the lack of standards representing the unobstructed flow conditions, because in a given channel the velocity, the depth, and the energy gradient of the unobstructed flow vary from section to section for a given discharge (which means that the flow is nonuniform). According to Liu, Bradley, and Plate (1957) such standards are in general essential for both theoretical and laboratory investigation.

Thus, Liu, Bradley, and Plate at Colorado State University undertook hydraulic studies of model bridge constrictions in tilting flumes having widths of 4 feet and 7.9 feet. For most of the experiments, the model was placed in the flume after uniform flow had been established. Limited studies of the abnormal stage-discharge condition were conducted. In addition to studying various geometries of bridge models, the roughness of the flume bed was varied in order to establish the effects of roughness upon backwater.

Liu, Bradley, and Plate (1957) used a combination of the continuity and energy equations to arrive at a general equation for the maximum backwater.

$$\left[\frac{y_1}{y_n}\right]^3 = \frac{3}{2} F_n^2 \left[\frac{9\Phi}{4M^2}\right] - 1 \quad \ldots\ldots \quad (8)$$

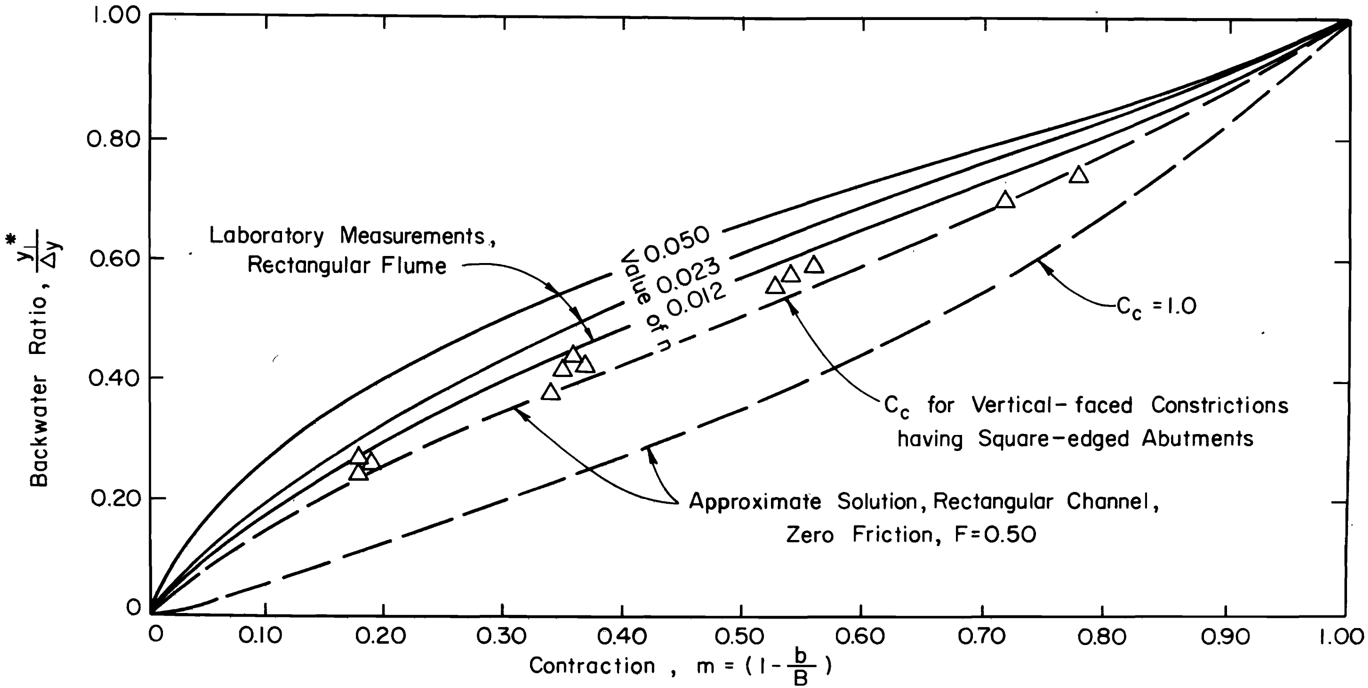

Figure 4. Variation of backwater ratio with contraction ratio and Manning's roughness coefficient. (Taken from Tracy and Carter, 1955.)

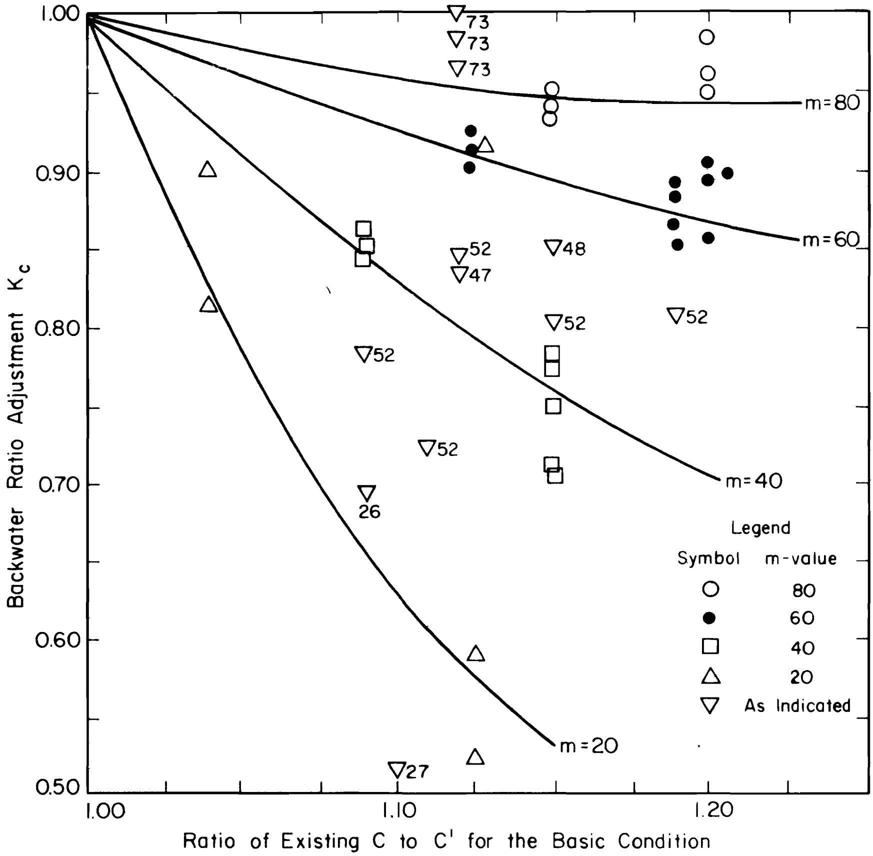

Figure 5. Variation of backwater ratio adjustment factor with discharge coefficient ratio. (Taken from Tracy and Carter, 1955.)

The coefficient, Φ , serves a three-fold purpose:

1. The coefficient corrects for nonuniform velocity distribution at sections I and II (Fig. 1), as well as nonhydrostatic pressure distribution at section II.
2. The coefficient corrects for the deviation of the actual flow conditions from critical depth (free flow) conditions at the contraction inlet.
3. The coefficient corrects for certain approximations due to neglecting terms of higher order in the derivation of Eq. 8, which is only important when $M > 0.8$.

The variation of Φ with the uniform flow Froude number, F_n, and the opening ratio, M, is shown in Fig. 6 for the vertical board (VB) model studied by Liu, Bradley, and Plate (1957). The coefficient, Φ, approaches unity for all

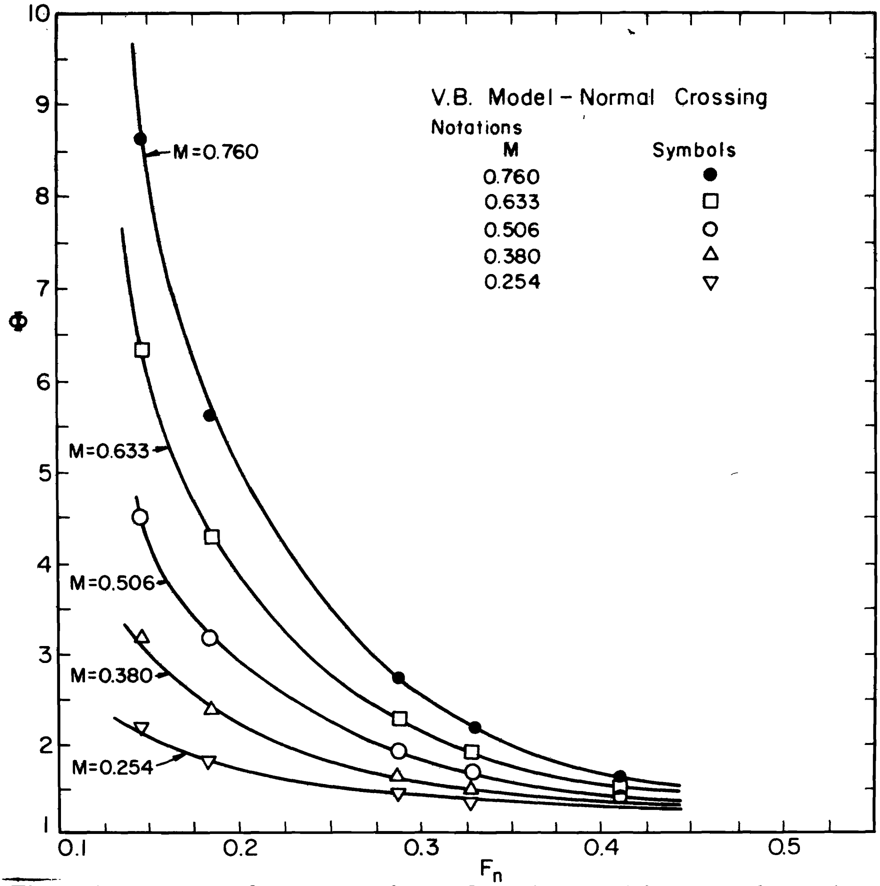

Figure 6. Variation of correction factor, Φ, with normal flow Froude number, F_n, and opening ratio, M, for vertical board model. (Taken from Liu, Bradley, and Plate, 1957.)

values of M when F_n approaches unity, whereas Φ approaches infinity for all values of M as F_n approaches zero. From a plot of actual data for the vertical board model (Fig. 7), along with a dimensional analysis of the backwater phenomena, an empirical backwater equation was developed.

$$\left[\frac{y_1}{y_n}\right]^3 = 4.48\, F_n^{\,2} \left[\frac{1}{M^2} - \frac{2}{3}\,(2.5 - M)\right] + 1 \quad . \; . \; (9)$$

By combining Eqs. 8 and 9, the relationship for Φ can be obtained.

$$\Phi = 1.33 \left[1 - \frac{2}{3} M^2 \left(2 - M - \frac{1}{3F_n^{\,2}}\right)\right] \quad . \; . \; . \; . \; . (10)$$

Biery and Delleur (1962) investigated the backwater due to single span arch bridge constrictions. They compared the results of their hydraulic tests with the data collected at Colorado State University for the vertical board model. A

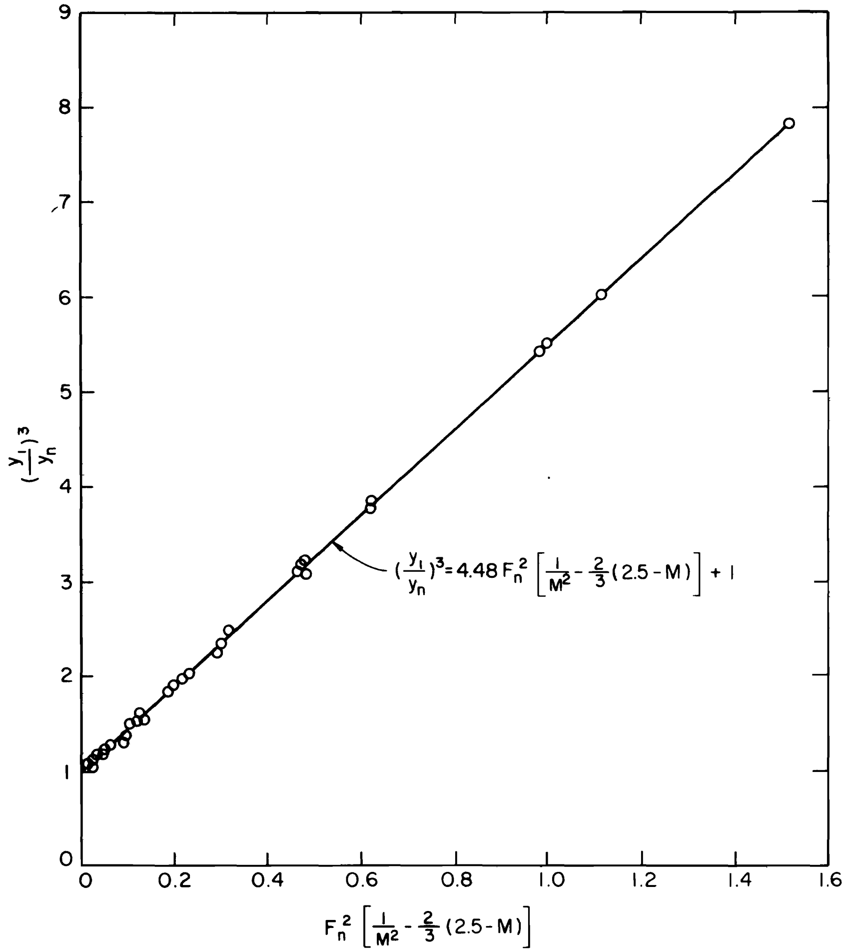

Figure 7. Comparison of experimental data with empirical backwater equation for vertical board model. (Taken from Liu, Bradley, and Plate, 1957.)

comparison of backwater data for various bridge geometries is shown in Fig. 8. A generalized empirical equation for the backwater ratio can be written as

$$\frac{y_1}{y_n} = 1 + 0.47 \left[\left(\frac{F_n}{M'}\right)^{2/3} \right]^{3.39} \quad \ldots\ldots (11)$$

where M' is the channel opening ratio, which is b/B for rectangular constrictions, but is a function of flow depth for arch bridges.

Design Procedure

Bradley (1960) compiled the results of the Colorado State University studies (Liu, Bradley, and Plate, 1957) into a design manual on "Hydraulics of

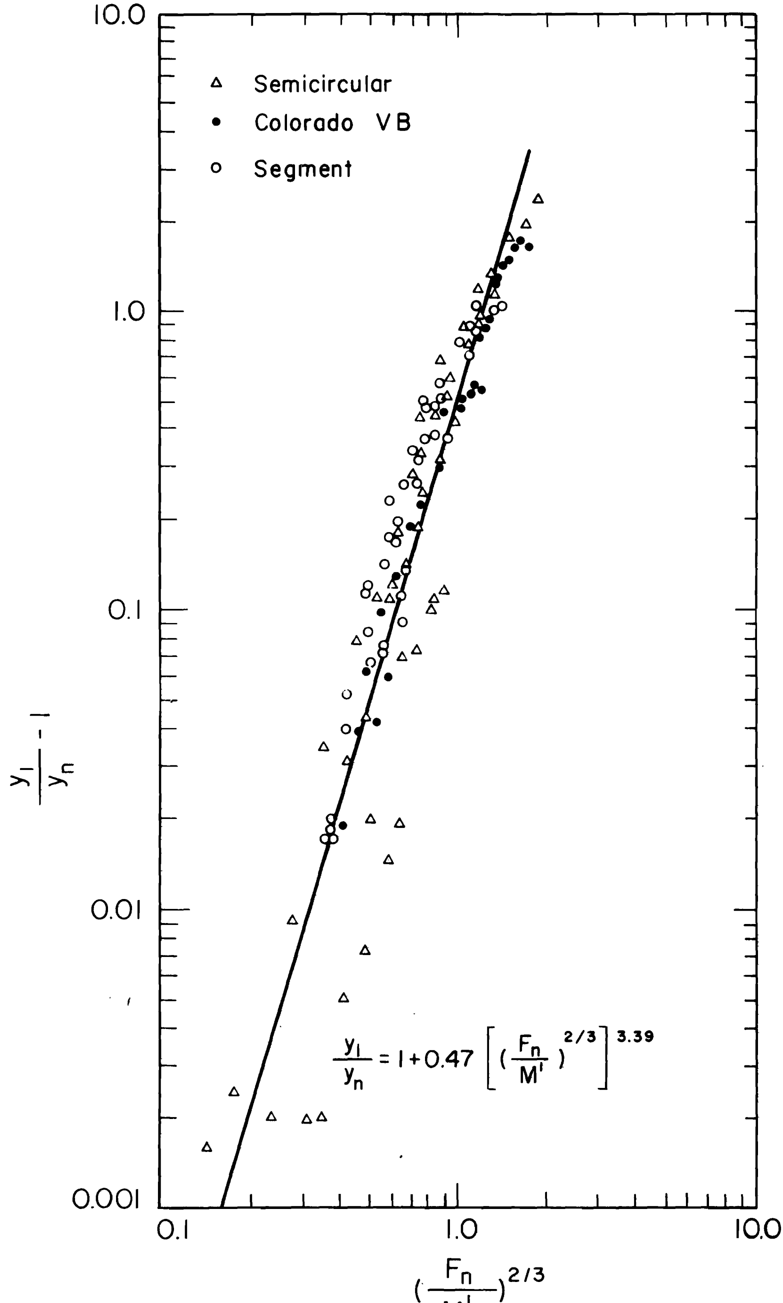

Figure 8. Generalized backwater ratio. (Taken from Biery and Delleur, 1962.)

Bridge Waterways." The general equation used for computing the backwater is

$$y_1^* = K^* \frac{V_{n2}^2}{2g} + \alpha_1 \left[\left(\frac{A_{n2}}{A_4} \right)^2 - \left(\frac{A_{n2}}{A_1} \right)^2 \right] \frac{V_{n2}^2}{2g} \quad \ldots (12)$$

where K^* is the total backwater coefficient, A_{n2} is the cross-sectional flow area in the constriction at normal stage ($A_{n2} = by_n$ for rectangular constrictions), and $V_{n2} = Q/A_{n2}$. As a first approximation of the backwater, y_1^*, the first term in Eq. 12 is used.

$$y_1^* = K^* \frac{V_{n2}}{2g} \quad \ldots\ldots\ldots\ldots (13)$$

After the first approximation of y_1^* has been computed from Eq. 13, the value of A_1 (which will also be approximate) can be computed. Then, a second approximation of y_1^* can be computed using Eq. 12. By trial and error, the backwater can be evaluated. The total backwater coefficient is the sum of the base coefficient, K_b, which is obtained from Fig. 9 for wingwall abutments; the incremental backwater coefficient for piers, ΔK_p, which is obtained from Fig. 10; the incremental backwater coefficient for eccentricity, ΔK_e, which is obtained from Fig. 11; and the incremental backwater coefficient for skew, ΔK_s, which is shown in Fig. 12 for wingwall abutments. Thus, the expression for K^* becomes

$$K^* = K_b + \Delta K_p + \Delta K_e + \Delta K_s \quad \ldots\ldots (14)$$

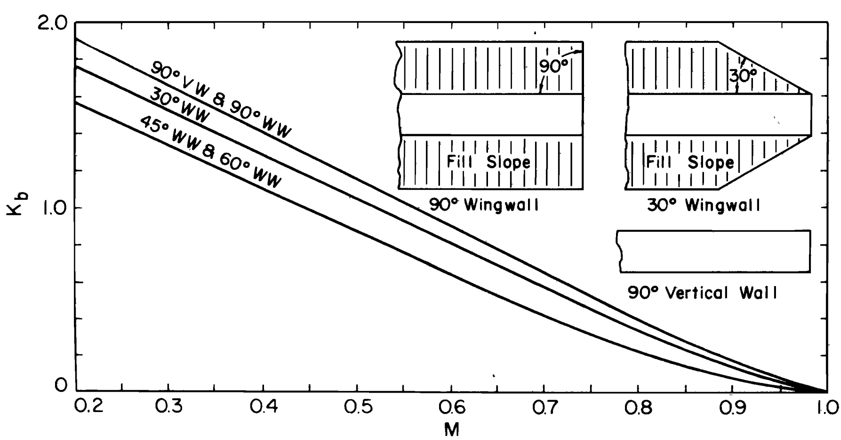

Figure 9. Base backwater coefficient curves for wingwall abutments. (Taken from Bradley, 1960.)

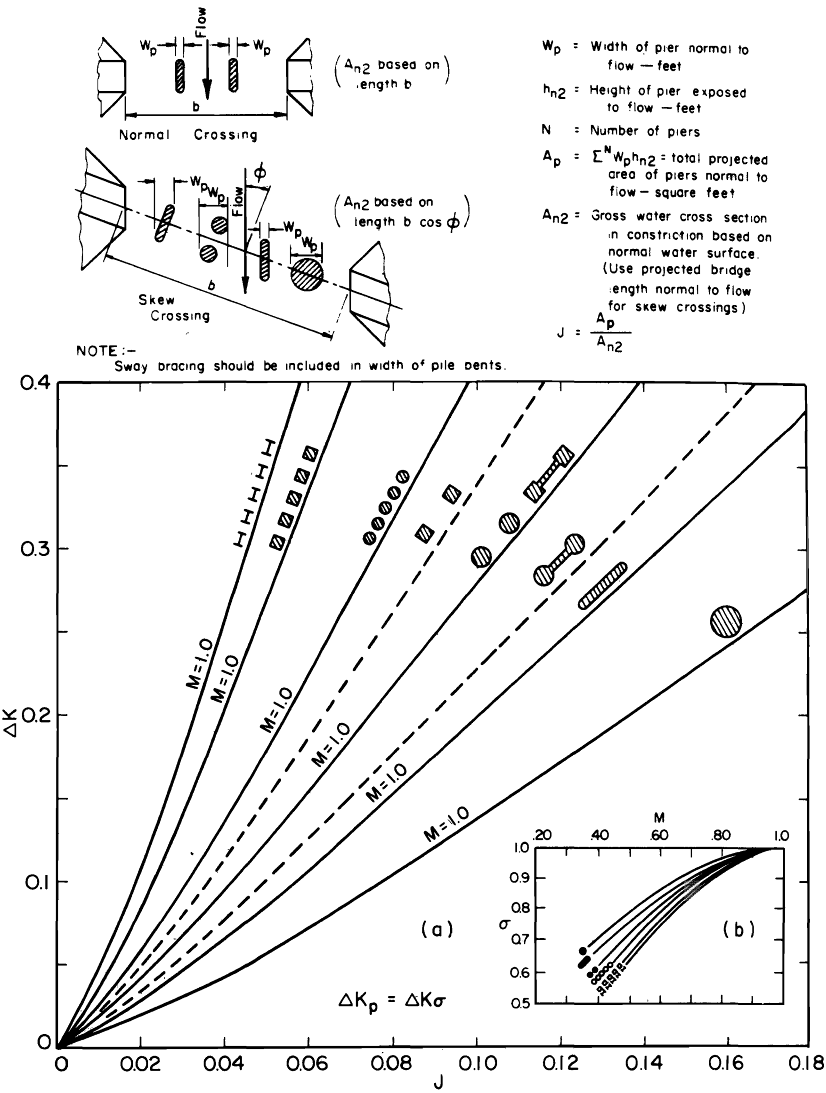

Figure 10. Incremental backwater coefficient for piers. (Taken from Bradley, 1960.)

Abnormal Stage-Discharge Condition

A design procedure for determining the backwater at bridge constrictions when abnormal stage-discharge conditions exist in the main channel has been developed by Liu, Bradley, and Plate (1957). This same design procedure has

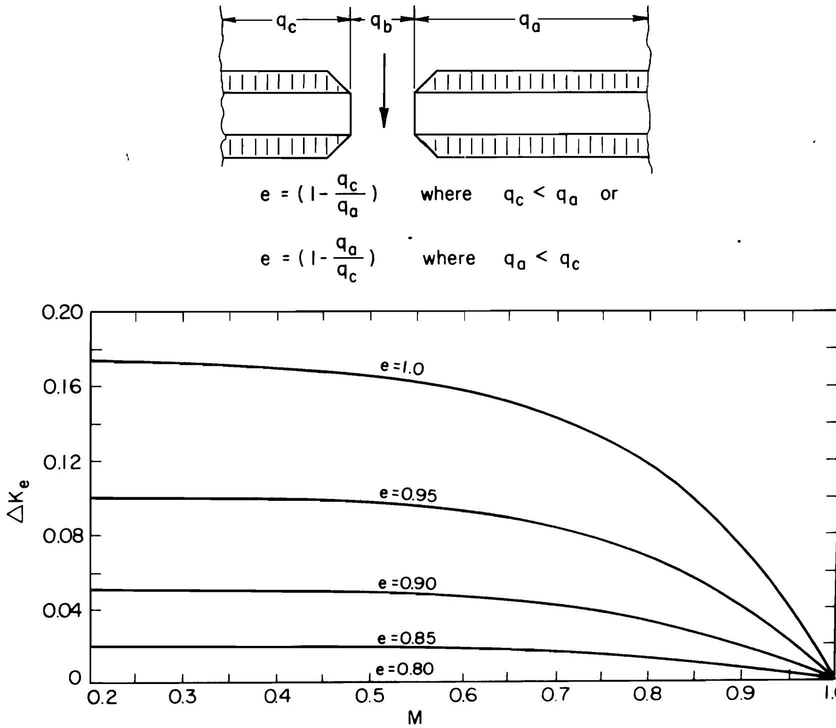

Figure 11. Incremental backwater coefficient for eccentricity. (Taken from Bradley, 1960.)

also been utilized in the design manual compiled by Bradley (1960). A definition sketch for the abnormal stage-discharge condition is shown in Fig. 13. The abnormal stage used in the design procedure is the depth of flow, y_A, that would occur in the river channel at section II prior to construction of the bridge. The subscript A has been used in the analysis to signify the abnormal condition.

The equation used to compute the maximum backwater at section I under abnormal stage is

$$y_{1A}^* = K^* \frac{V_{2A}^2}{2g} \qquad (15)$$

in which $v_{2A} = Q/A_{2A}$ and A_{2A} is the cross-sectional flow area in the constriction for abnormal stage ($A_{2A} = by_A$ for rectangular bridge constrictions). In order to determine the total backwater coefficient, K*, Eq. 14 is used in conjunction with Figs. 9, 10, 11, and 12. Because the solution for backwater under abnormal stage conditions is only a rough approximation, the terms involving the difference in kinetic energy between sections I and IV used in Eq. 12 have been omitted from Eq. 15.

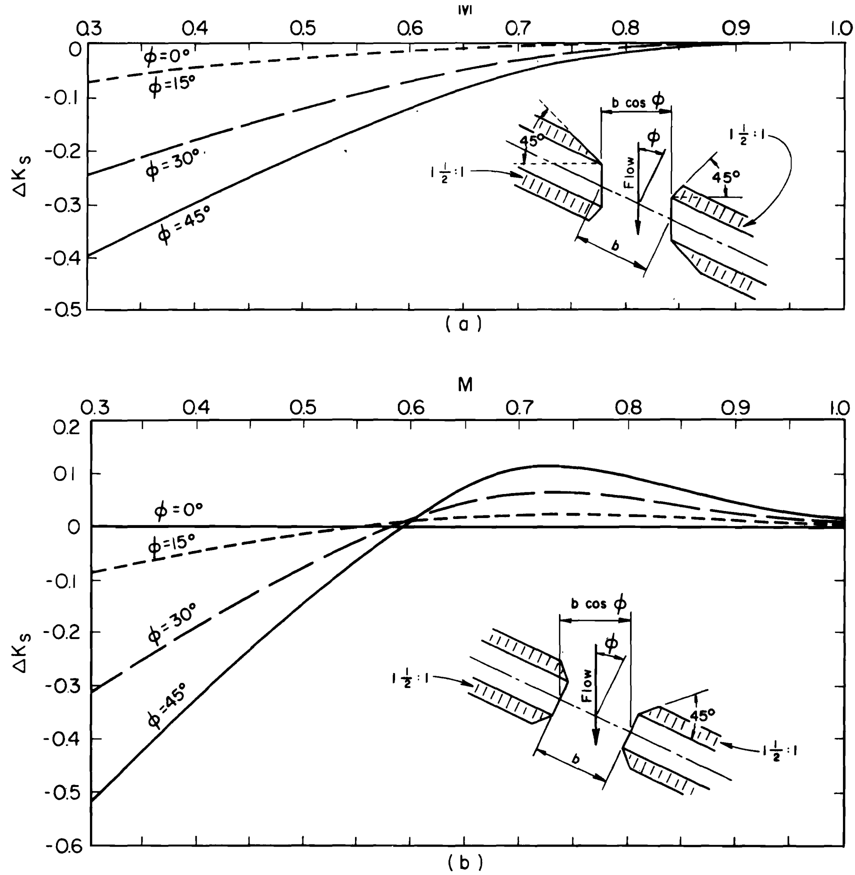

Figure 12. Incremental skew backwater coefficient for wingwall abutments. (Taken from Bradley, 1960.)

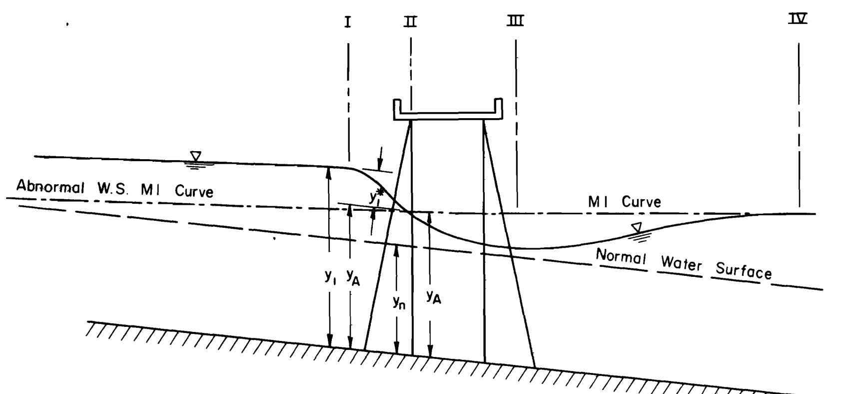

Figure 13. Definition sketch for abnormal stage-discharge condition. (Taken from Liu, Bradley, and Plate, 1957.)

SUBCRITICAL FLOW ANALYSIS

Techniques for analyzing subcritical flow at side constrictions (e.g. flow measuring flumes) and overflow structures (e.g. weirs) have been reported by Skogerboe and Hyatt (1967a, 1967b). Discharge ratings for either flumes or weirs have been developed for both free flow and submerged flow. The distinguishing difference between the two flow conditions is the occurrence of critical depth, usually near the weir crest or inlet to the flume throat. When free flow conditions exist, the flow is subcritical upstream from the constriction (depth of flow greater than critical depth) whereas in the constriction the flow is supercritical (depth of flow less than critical depth). With supercritical flow occurring in the constriction, a change in flow depth downstream from the constriction will not change the depth of flow upstream from the constriction. This critical flow control requires only the measurement of a flow depth at some location upstream from the section having critical depth in order to determine the discharge.

Submerged (subcritical) flow conditions exist when the downstream, or tailwater, depth is raised to such a level that the flow depths at every point through the constriction become greater than critical depth. Under submerged flow conditions, a change in the tailwater depth also affects the upstream depth. Thus, a discharge rating for the constriction requires that two flow depths be measured, one upstream and one downstream from the constriction.

The condition at which the flow changes from free flow to submerged flow is a transition state that is unstable. The value of submergence, S (where submergence is defined as the ratio of a downstream flow depth divided by an upstream flow depth usually expressed as a percentage) at which this condition occurs is referred to as the transition submergence, S_t. This change from supercritical flow in the constriction to subcritical flow signifies that the Froude number is equal to 1 at a single flow cross section (the cross section at which critical depth occurs), and for every other cross section upstream the Froude number is less than 1 (subcritical flow). At the transition from free flow to submerged flow, the discharge equations for the two flow conditions should give the same flow. Consequently, if the discharge equations are known, the transition submergence can be obtained by setting the free flow and submerged flow equations equal to one another.

Free flow, submerged flow, and the transition submergence are illustrated in Fig. 14 for a simple side constriction. Water surface profile a represents free flow conditions, whereas profile b illustrates the transition submergence condition, and water surface profiles c and d portray submerged flow. Profile a

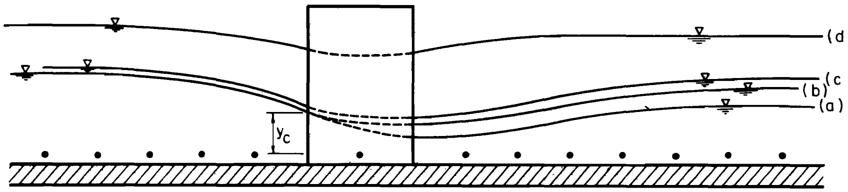

Figure 14. Illustration of free flow (a,b) and submerged flow (c,d) in a constriction.

represents a low submergence resulting in a jetting action at the constriction outlet. Profile b represents the transition from free flow to submerged flow, and the difference between profiles a and b illustrates the wide range of tailwater depths that still result in critical-depth flow in the constriction. Water surface profiles c and d represent submerged flow conditions with profile c having a value of submergence slightly greater than the transition submergence (profile b), whereas profile d illustrates an even higher degree of submergence. Of particular importance is the change in upstream flow depth under subcritical conditions.

The free flow discharge equation can be written as

$$Q = Cy_u^{n_1} \quad \text{. . . . .(16)}$$

in which y_u is a flow depth upstream from the constriction, C is the free flow coefficient, and n_1 is an exponent primarily dependent upon the constriction geometry (e.g. n_1 is approximately equal to 3/2 for rectangular constrictions). The above equation will plot as a straight line on logarithmic paper.

The submerged flow discharge equation (Skogerboe, Hyatt, and Eggleston, 1967) can be written as

$$Q = \frac{C_1 (y_u - y_d)^{n_1}}{[-(\log S + C_2)]^{n_2}} \quad \text{. . . . . . .(17)}$$

in which y_d is a flow depth downstream from the constriction, S is the submergence ($S = y_d/y_u$), C_1 and C_2 are coefficients, and n_2 is the submergence exponent. Usually, C_2 is very small and can be taken as zero. The exponent n_2 varies between 1 and 3/2 for rectangular constrictions (n_2 approaches 1 for fully constricted (M approaches 0) channels and n_2 approaches 3/2 for channels having no constriction). The submerged flow equation can be plotted as a family of straight lines on logarithmic paper, where Q is the ordinate, $y_u - y_d$ is the abscissa, and each straight line represents a particular value of the submergence, S. A typical submerged flow plot (y_1 upstream flow depth and y_4 downstream flow depth) is shown in Fig. 15. The line in Fig. 15, which represents the free flow equation, corresponds to the transition submergence, S_t.

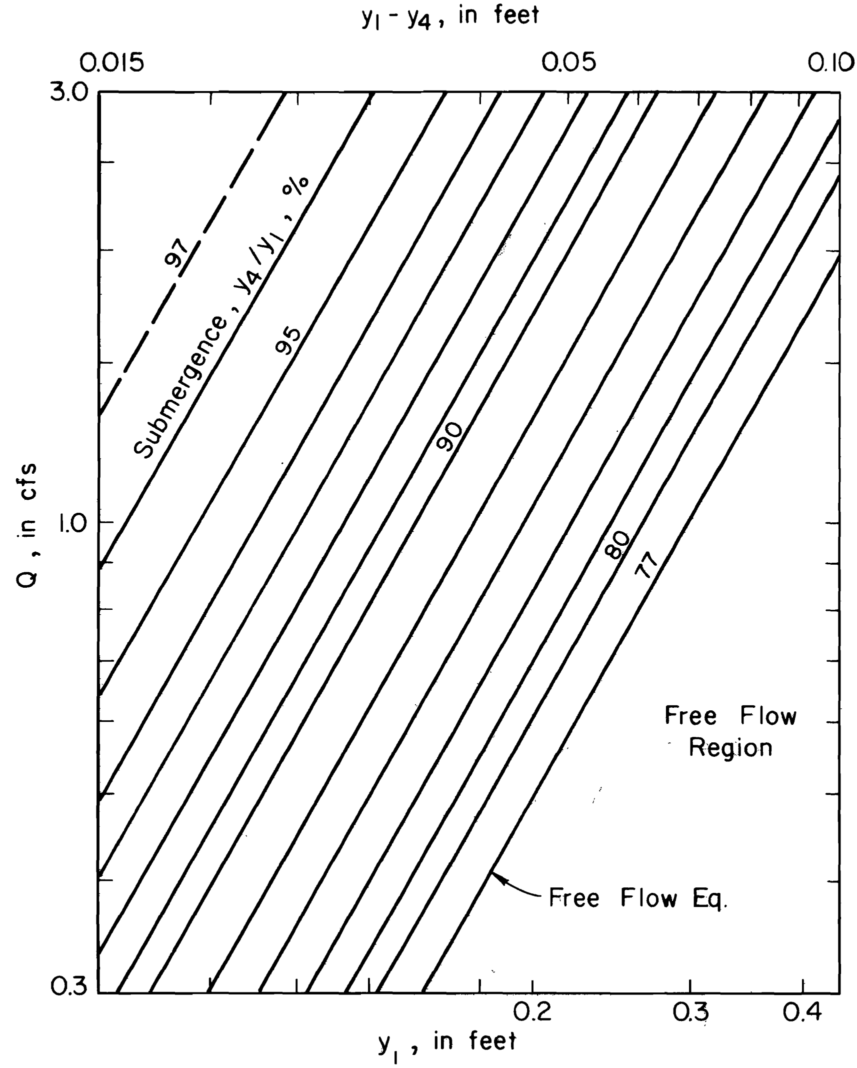

Figure 15. Typical example of submerged flow and free flow rating curves for a constriction. (Taken from Skogerboe and Hyatt, 1967a.)

The technique shown above for analyzing submerged flow at open channel constrictions can be modified in order to analyze energy losses due to constrictions. This is accomplished by substituting E_u and E_d for y_u and y_d in Eqs. 16 and 17, where E_u and E_d are the specific energies at locations upstream and downstream from the constriction. Thus, the abscissa of a submerged flow plot would become $E_u - E_d$, which is the energy loss, or head loss, h_L. A typical family of discharge-energy loss curves for a constriction is shown in Fig. 16.

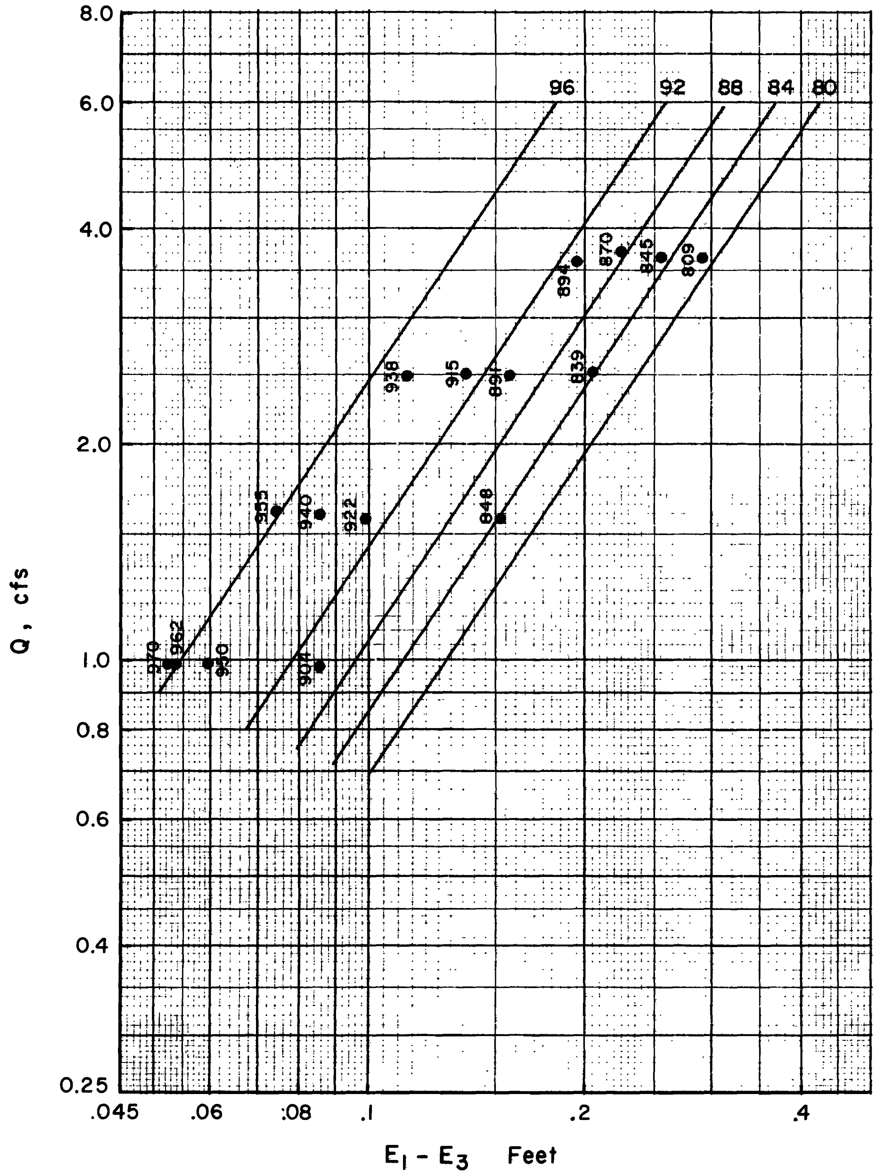

Figure 16. Typical discharge-energy loss curves for a constriction under subcritical flow conditions.

In designing a constriction to be placed in an open channel which will be used as a flow measuring device, the hydraulic engineer would prefer to constrict the channel sufficiently to insure free flow throughout the entire range of expected discharges. In designing a bridge constriction, the hydraulic engineer prefers to limit the amount of channel constriction in order to avoid having supercritical flow in the constriction, which would result in an increased scour potential at the bridge.

If a river channel is sufficiently constricted by the bridge abutments, critical depth will occur in the constriction, thereby resulting in free flow conditions and the backwater will be called "contraction backwater." The amount of river constriction caused by the construction of a bridge can be limited to insure subcritical flow through the bridged waterway. For subcritical flow, two flow conditions are described in the literature. The most common subcritical flow condition referred to in the literature regarding bridge constrictions is the "resistance backwater," wherein a unique stage-discharge relation exists for the constriction. The "abnormal stage-discharge condition" referred to in the literature is comparable to the usual submerged flow condition encountered with flow measuring devices. In fact, the "resistance backwater" condition is a special case of the "abnormal stage-discharge condition." For this abnormal condition, a unique stage- discharge rating does not exist except in the limiting case. Instead, a stage-fall-discharge rating, or a submerged flow rating, must be developed for the constriction in order to evaluate the discharge.

EXPERIMENTAL DESIGN

As mentioned earlier, the intent of this research effort was to develop a method of backwater analysis for bridge constrictions when abnormal stage-discharge conditions exist. Basically, the technique to be developed will incorporate the subcritical flow analysis previously developed at Utah State University (Skogerboe and Hyatt, 1967a, 1967b) for flow measuring flumes and weirs. In order to compute the backwater caused by bridge constrictions, an analysis of flow resistance will be necessary for the main channel without a constriction under both uniform and nonuniform flow conditions.

Since the investigations at Colorado State University (Liu, Bradley, and Plate, 1957) regarding backwater due to bridge constrictions represent the most recent and extensive analysis available, it was decided that certain portions of their studies should be duplicated. Then, the investigations and analysis of abnormal stage-discharge conditions could be added. By using some of the same bridge constriction models studied by Colorado State University, there was the advantage of possibly being able to project the backwater analysis developed from a few bridge constriction geometries under abnormal stage-discharge conditions to all of the bridge geometries investigated by Liu, Bradley, and Plate (1957). In addition, it was necessary to duplicate the same roughness pattern placed on the flume bed.

A tilting flume is necessary in order to evaluate backwater under uniform flow conditions. After placing the roughness pattern used in these studies, the tilting flume could be placed at a particular slope and uniform flow established for a series of discharge values. This procedure could be accomplished for a number of bed slopes. The flow resistance analysis reported by Overton (1967) could be incorporated in developing the relationship between discharge, Q, and normal flow depth, y_n.

In order to evaluate backwater due to bridge constrictions under abnormal stage-discharge conditions, it becomes necessary to develop the nonuniform flow relationship for the tilting flume without any constriction (zero constriction case). This can be accomplished by using a constant discharge, but varying the tailgate and consequently, increasing the depth of flow. This procedure can be repeated for a series of discharge values. Also, data can be collected for a number of bed slopes. In all cases under this investigation, the nonuniform flow depth is greater than the normal flow depth. Thus, all of the water surface profiles for nonuniform flow are M1 backwater curves.

The bridge constrictions selected for study were the vertical board, which is frequently referred to as a simple normal crossing by Liu, Bradley, and Plate

(1957), and 60° wingwall abutments. For each constriction geometry, the width of opening was varied to give opening ratios, M (M = b/B for rectangular constrictions where b is the constriction width and B is the channel width), of approximately 1/4, 1/2, and 3/4. Consequently, 6 constrictions would be studied--3 vertical board bridge models and 3 60° wingwall bridge models. In each case, both free flow and submerged flow ratings would be developed for the same series of bed slopes, S_b, used in developing uniform and nonuniform flow relationships for the tilting flume without a constriction (zero constriction case).

A comparison of the free flow rating for a constriction with uniform flow conditions in the main channel yields the "contraction backwater," whereas a comparison of the submerged flow rating with uniform flow would be called the "resistance backwater." Whenever the backwater is computed using nonuniform flow conditions as a base, the term "abnormal stage-discharge backwater" would be used, but it should be remembered that either free flow or submerged flow conditions could exist at the constriction. Therefore, the backwater analysis would be expected to be different depending upon whether or not free flow or submerged flow occurred at the bridge.

EXPERIMENTAL FACILITIES

Physical Layout

The experimental tilting flume used for studying the application of subcritical flow techniques to backwater analysis at bridge constrictions is shown in Fig. 17. The flume is located in the Utah Water Research Laboratory at Utah State University. Detail regarding the layout and operation of the flume is shown in Fig. 18.

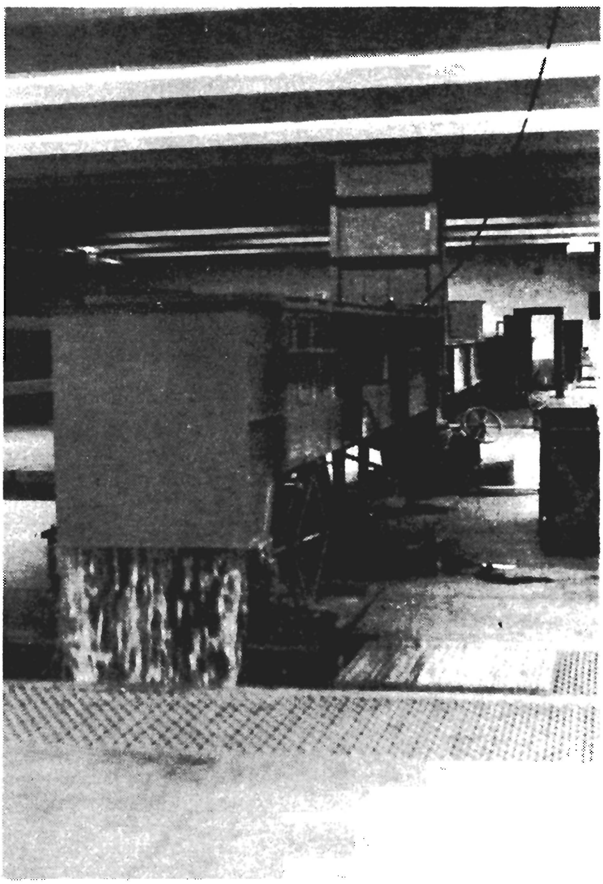

Figure 17. Experimental tilting flume.

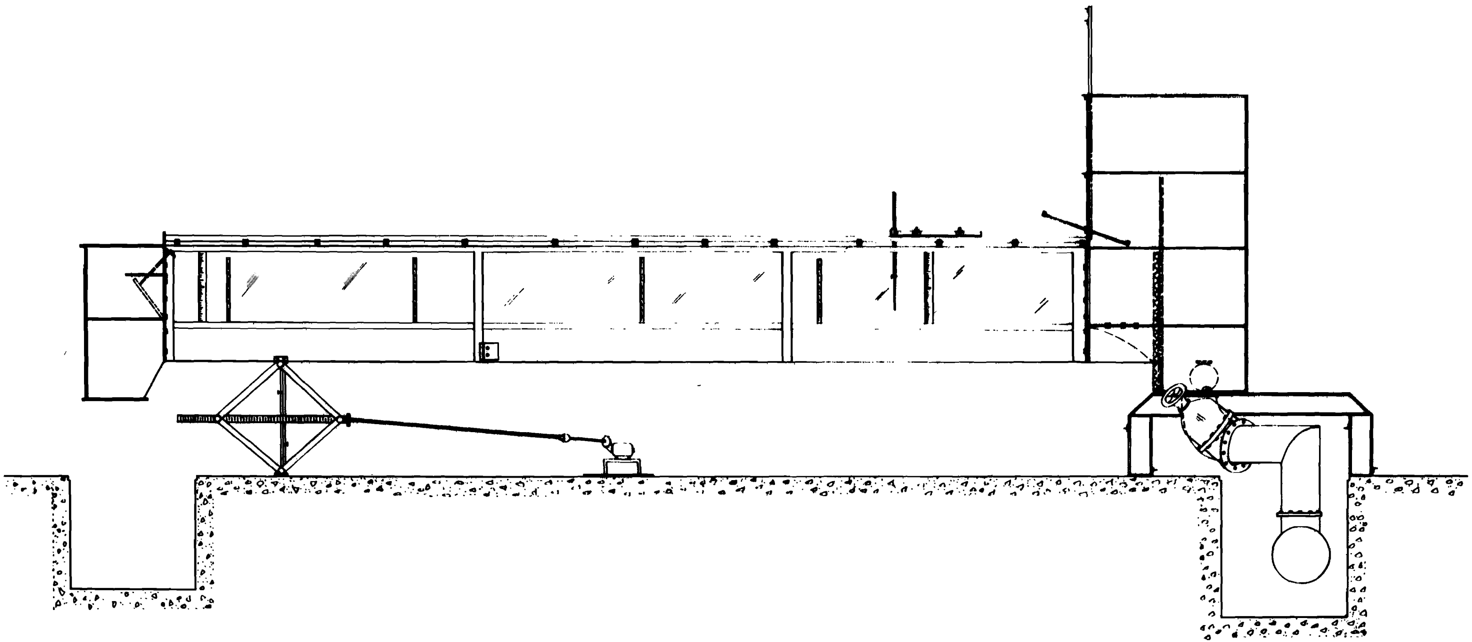

Figure 18. Detailed drawing of tilting flume.

The water supply for the laboratory is obtained from a small dam and reservoir located on the Logan River a short distance upstream. The water is conveyed from the reservoir to the laboratory through a 48-inch pipeline. Branches from this main pipeline convey water to the headbox of the tilting flume. The amount of discharge entering the headbox is controlled by a gate valve (Fig. 18).

The geometry of the headbox, along with the baffle arrangement in the headbox, insures that the flow pattern will be established in a short distance downstream from the flume inlet. The tilting flume is 24 feet long, 3.02 feet wide, and approximately 2.5 feet deep. The depth of flow in the flume can be controlled by an overflow tailgate located at the flume exit. The tailgate, which is shown in Fig. 19, is operated manually by a threaded rod connected to the gate.

Figure 19. Overflow tailgate used at tilting flume outlet.

The water passing over the tailgate drops into a concrete channel recessed in the laboratory floor (Fig. 18). The concrete channel conveys the water to the weighing tanks. The water is then discharged from the weighing tanks and is conveyed back to the Logan River.

The bed slope of the flume can be adjusted by means of the scissor jack arrangement shown in Fig. 18. The upstream end of the tilting flume pivots, while the downstream end of the flume is raised or lowered by the electric motor operation of the jack.

An artificial roughness was installed on the flume floor which was similar to the roughness used by Liu, Bradley, and Plate (1957). The roughness pattern was constructed from 1/4 inch diameter smooth rod. The roughness pattern, which is shown in Fig. 20, has a 6 inch longitudinal spacing and a 9 inch transverse (perpendicular to the direction of flow) spacing. The longitudinal rods rest directly on the flume floor. Consequently, the top of the transverse bar is 1/2 inch above the flume bottom. The roughness pattern was welded on the downstream side of each joint and anchored to the flume bottom by bolting small straps of metal over the rods.

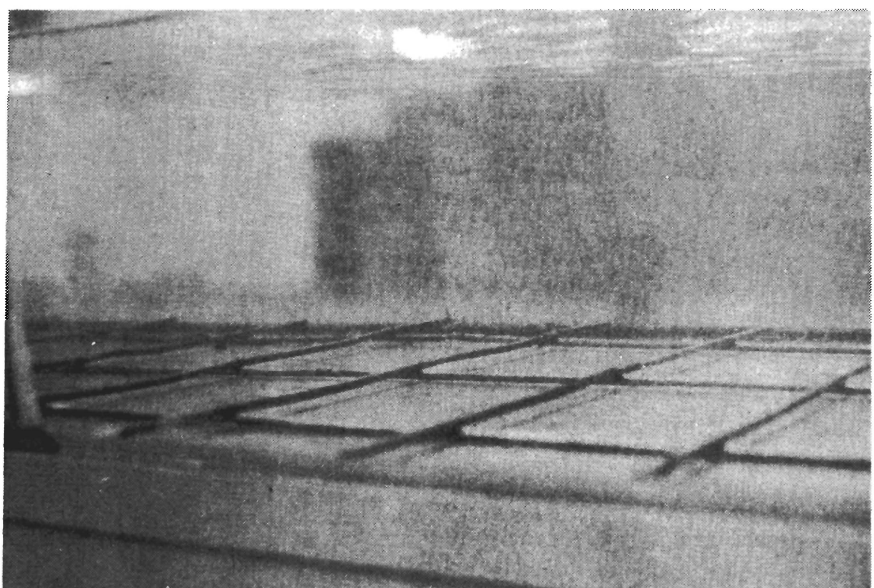

Figure 20. Roughness pattern used in tilting flumes.

Instrumentation

The data collected during the studies reported herein consisted of the bed slope, flow depths along the flume length, channel width, bridge constriction shape (whether vertical board or 60° wingwall), constriction width, and discharge.

By taking into account the flume length, a vertical scale could be located at the downstream end of the flume which indicated the bed slope. The slope scale was particularly useful since fixed values of bed slope were used in conducting the experiments. The predetermined bed slopes of 0.0012, 0.0020, 0.0032, and 0.0050 could be quickly set using this method.

The measurement of flow depths along the flume length required a considerable amount of effort. The tilting flume is equipped with brass rods located along the top of each flume wall, which serve as rails for the instrument carriage shown in Fig. 21. The carriage is equipped with three point gages which are located at the 1/4, 1/2, and 3/4 points across the flume width. In order to establish water surface profiles, flow depth measurements were collected every 2 feet along the 24-foot length of the flume. At each cross section, all three point gages were used to measure both the flume bottom and water surface, except when a bridge constriction prevented the use of the two outside point gages. When a constriction was located in the flume, up to six additional flow depth measurements were collected depending upon the amount of data needed to describe the water surface profile in the immediate vicinity of the constriction. The cross-sections where flow depth measurements were collected, as well as the location of the six model bridge constrictions, are shown in Fig. 22.

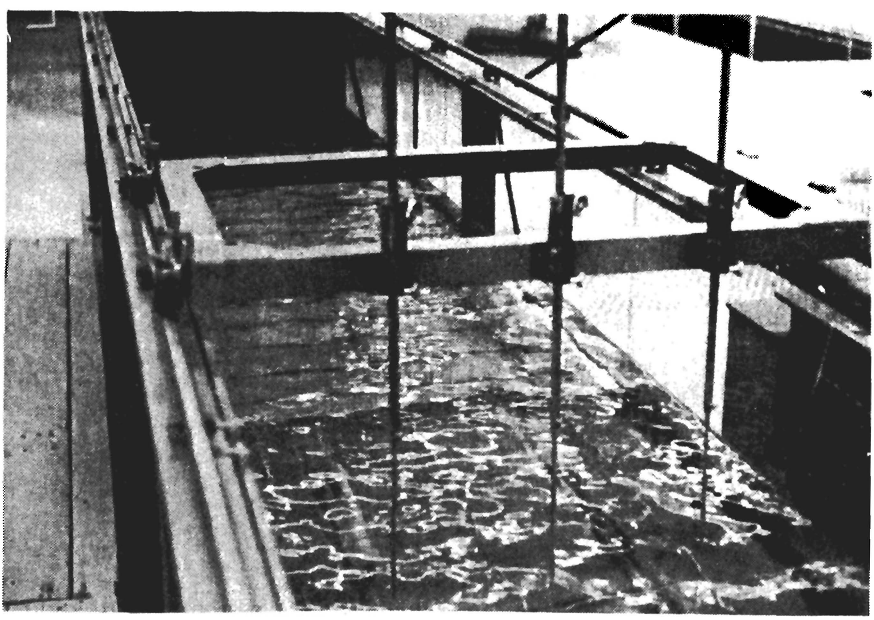

Figure 21. Instrument carriage for tilting flume.

In constructing the vertical board and 60° wingwall model bridges, an attempt was made to have opening ratios of 1/4, 1/2, and 3/4. After constriction was placed in the tilting flumes, the width was carefully measured throughout the height of the constriction. In each case, the opening ratio differed slightly from the desired values.

As previously indicated, the discharge was measured by means of weighing tanks. The weighing tanks are operated automatically and the water can be continually switched from one tank to the other. The flow rate was measured several times during each run.

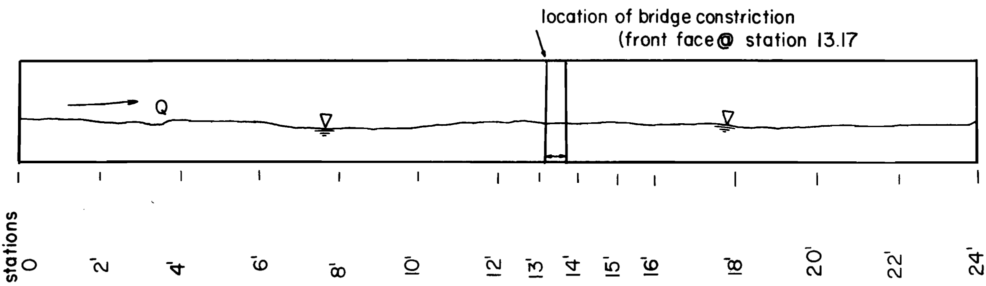

Figure 22. Location of constrictions in tilting flume and cross-sections where flow depths were measured.

CHANNEL FLOW RESISTANCE

Uniform Flow

Overton (1967) has used data collected by Ragan (1965) to illustrate a technique for flow resistance analysis. The data reported by Ragan were obtained using a flume 72 feet long and 8 inches square constructed of sheet aluminum and artificially roughened with 1/4 inch angle aluminum cemented to the sides and bottom of the flume at 1-foot intervals. The slope of the flume was 0.2 percent for all seven steady uniform flow runs.

The Chezy equation can be written as

$$Q = C\ A\ (RS_e)^{1/2} \qquad (18)$$

where C is the Chezy resistance coefficient, A is the cross-sectional area of flow, R is the hydraulic radius, and S_e is the slope of the energy line (which is equal to the bed slope for uniform flow). The Darcy-Weisbach equation can be written as

$$Q = A\ (8gRS_e/f)^{1/2} \qquad (19)$$

where f is the Darcy-Weisbach resistance coefficient. Thus, the Chezy and Darcy-Weisbach resistance coefficients can be related by the equation

$$C = (8g/f)^{1/2} \qquad (20)$$

If the discharge is plotted against $A(RS_e)^{1/2}$ or $A(8gRS_e)^{1/2}$, a linear relationship should result where the slope is equal to C or $(1/f)^{1/2}$, respectively. The discharge has been plotted against $A(8gRS_e)^{1/2}$ in Fig. 23 using the data collected by Ragan (1965). A linear regression was performed on these data by Overton (1967) and the following equation was obtained.

$$Q = 2.67\ A(8gRS_e)^{1/2} - 0.0075 \qquad (21)$$

As shown in Fig. 23, the regression line did not intersect the origin. Instead, a negative regression intercept of 0.0075 resulted. The existence of this intercept suggests that a diminished cross-sectional flow area, obtained by referencing flow depths to some statistically determined height above the flume floor, would shift the line through the origin. This height or roughness parameter may be viewed as a forcing function to affect the proportionality in the Chezy and Darcy-Weisbach flow resistance formulas (Overton, 1967). The roughness parameter is apparently related to roughness length in a manner similar to the Karman-Prandtl logarithmic velocity profile intercept (Overton, 1967).

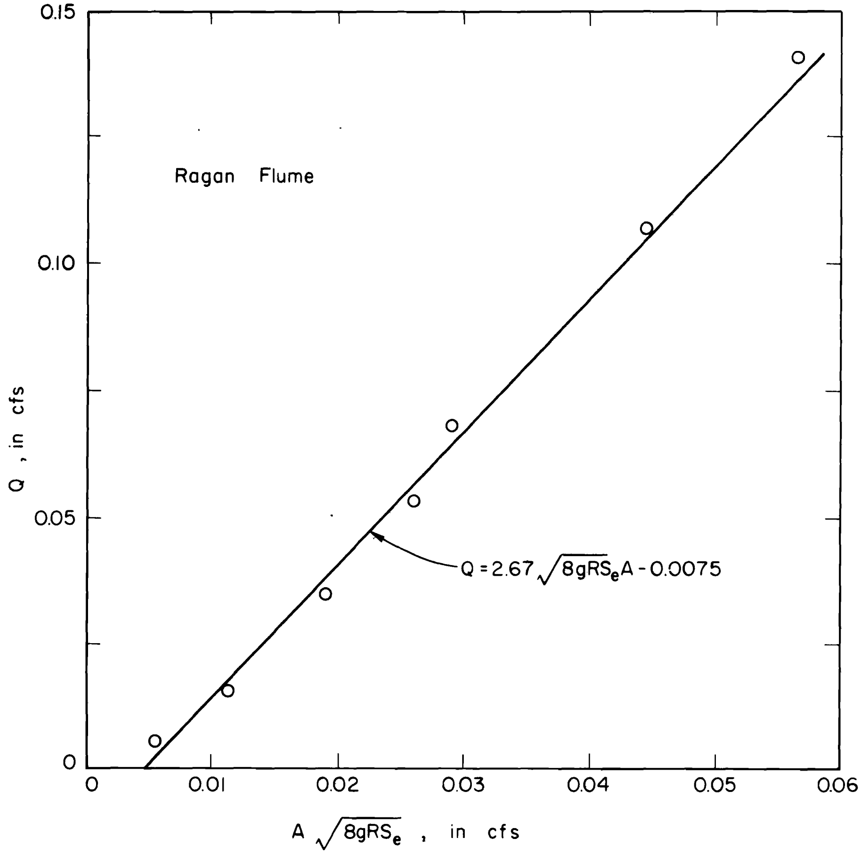

Figure 23. Plot of discharge against $A(8gRS_e)^{1/2}$ for data collected by Ragan (1965). (Taken from Overton, 1967.)

By introducing a roughness parameter, y_s, which becomes a correction to the effective flow depth, the effective flow area, A', and effective hydraulic radius, R', become

$$A' = B(y - y_s) \quad \ldots\ldots\ldots\ldots\ldots (22)$$

$$R' = \frac{B\,(y - y_s)}{B + 2\,(y - y_s)} \quad \ldots\ldots\ldots\ldots (23)$$

where B is the channel width and y is the flow depth under uniform flow conditions measured from the channel bed to the water surface. Using an iterative procedure for the Ragan data, Overton (1967) determined that the roughness parameter was equal to 0.030 feet and the flow resistance equation becomes

$$Q = 2.84 A' (8gR' S_e)^{1/2} \quad \ldots\ldots\ldots (24)$$

Using the calculated value of the roughness parameter (y_s = 0.030 feet) in Eqs. 22 and 23, which are then inserted into Eq. 24, a constant resistance coefficient resulted as shown in Fig. 24. The calculated roughness parameter was of the same order of magnitude as the height of the roughness elements in the flume, since the 1/4 inch aluminum roughness elements were 0.0208 feet high and y_s was 0.030 feet.

The flow resistance technique portrayed in Figs. 23 and 24 was utilized in analyzing the uniform flow data collected in the tilting flume. Plots were

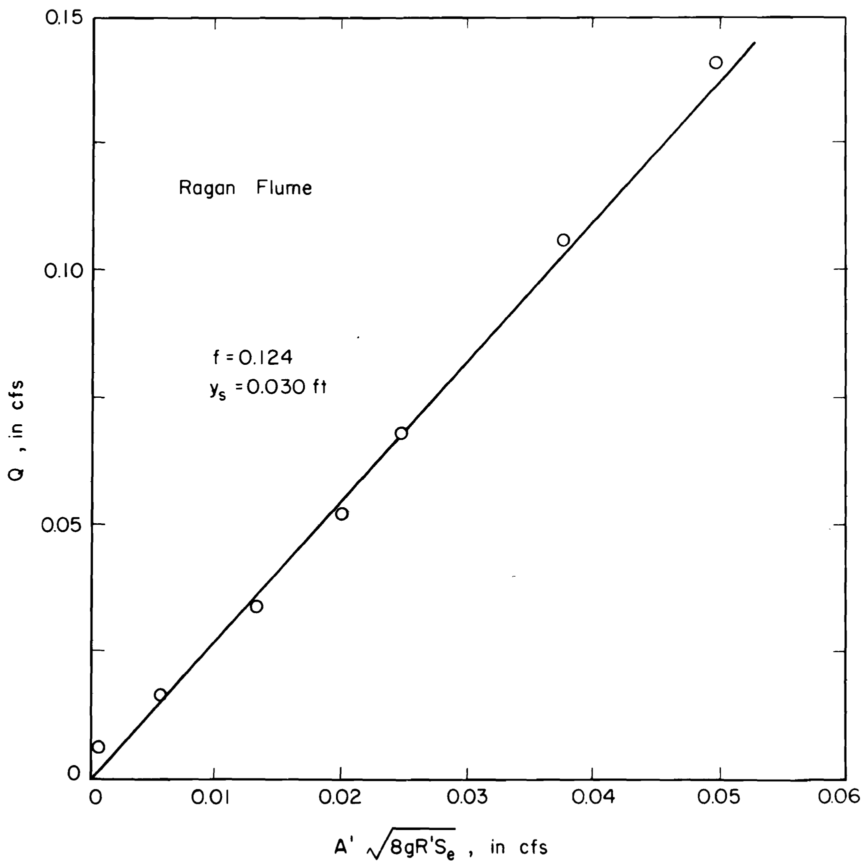

Figure 24. Plot of discharge against A' $(8gR' S_e)^{1/2}$ for a roughness parameter of 0.030 feet. (Taken from Overton, 1967.)

prepared for each of the four slopes used as a part of this study, namely 0.0012, 0.0020, 0.0032, and 0.0050 (Fig. 25). From a composite of these four plots, the roughness parameter, y_s, was determined to be 0.030 feet and the Chezy resistance coefficient was 68. Similar plots were prepared using Manning's equation. Interestingly, the roughness parameter was still 0.030 feet. For the range of discharges and flow depths used in this study, the Manning roughness coefficient, n, is about 0.019. The total height of the roughness pattern used in this study was 0.041 feet (two 1-inch diameter rods). Thus, the effective bed level is below the top of the roughness pattern.

After studying the water surface profiles with the bridge constrictions in place, it was determined that the flow depths measured at station 6 (which is 6 feet downstream from the tilting flume inlet) could be used to represent

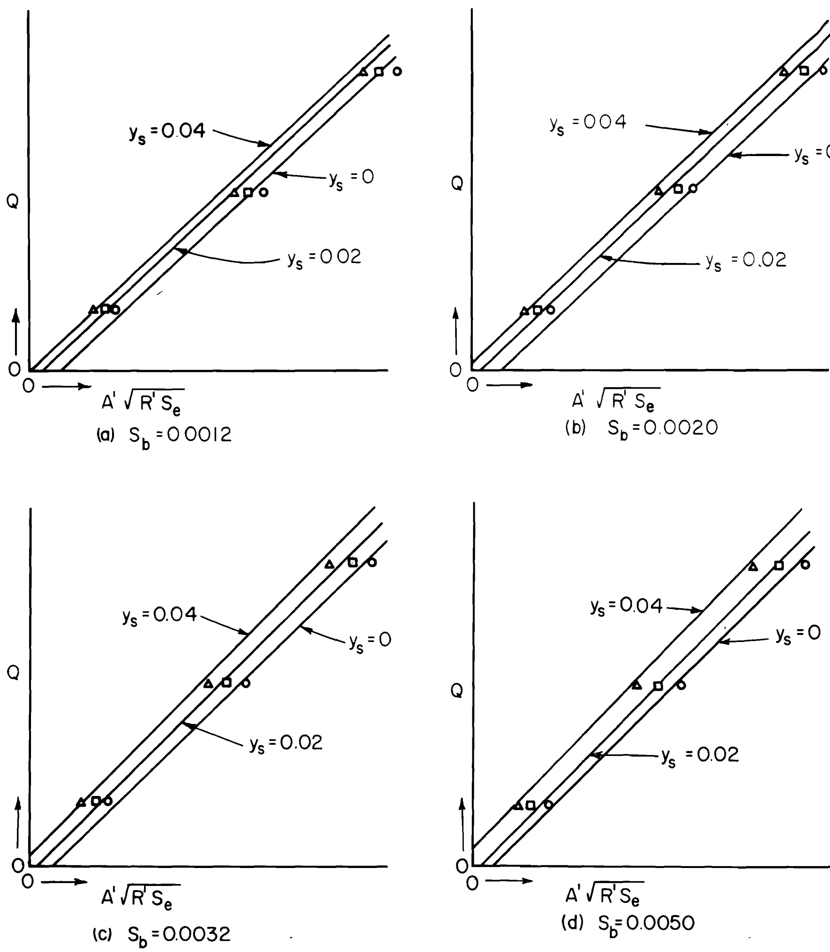

Figure 25. Plots of discharge against A' $(R' S_e)^{1/2}$ for tilting flume.

section I (Fig. 1), while the flow depths measured at station 18 could represent section IV (Fig. 1). Then, setting the datum as the effective bed level at section IV, as shown in Fig. 26, the energy at section IV becomes

$$E_4 = y_4 + V_4^2/2g \qquad (25)$$

while the energy at section I is

$$E_1 = 12S_b + y_1 + V_1^2/2g \qquad (26)$$

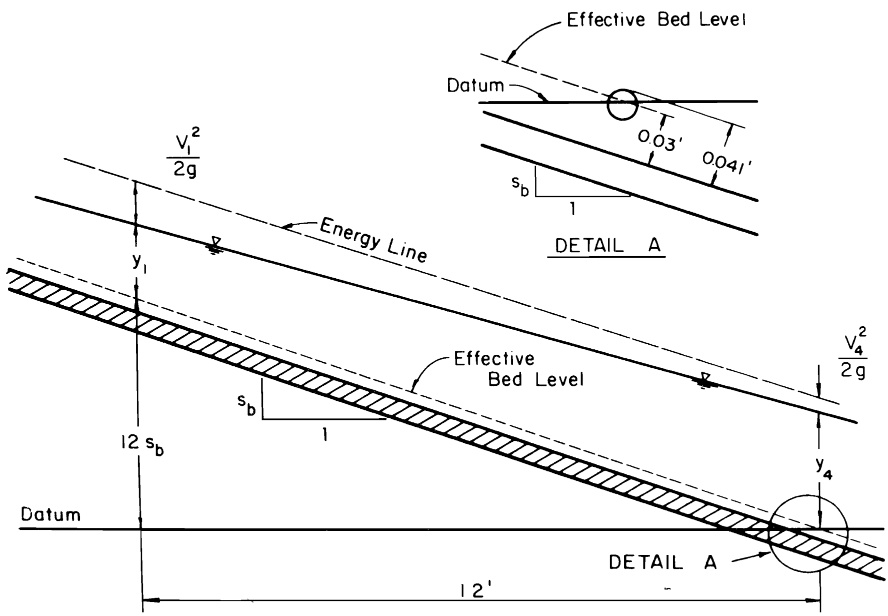

Figure 26. Definition sketch for datum in tilting flume.

Nonuniform Flow

The nonuniform flow data used in this study were obtained immediately following the establishment of uniform flow. For a fixed bed slope and constant discharge, the overflow tailgate at the exit of the tilting flume (Fig. 19) was adjusted until uniform flow existed in the flume. Then, the tailgate would be raised slightly, thereby increasing the flow depth and creating an M1 backwater curve. When the flow had again become steady, the flow depths along the flume length would be measured. Then, the tailgate would be raised again, and again, until a number of sets of data had been collected. This procedure was followed for each discharge and each bed slope used in this study.

If a bridge constriction had been placed in the channel, and the above procedure followed, submerged (subcritical) flow ratings for the constriction could have been developed from the data, which would have been similar to the ratings shown in Fig. 15 or 16. Nonuniform flow in an open channel (such as the tilting flume) without a constriction is a limiting case, which could be termed the "zero constriction case." An important question, then, is whether or not the subcritical flow analysis used in developing ratings for constrictions would still be valid for the special "zero constriction case." As shown in Fig. 27, the data do plot in straight lines and form the family of E_4/E_1, lines which show that the subcritical flow analysis applies to nonuniform flow in open channels.

The data have been plotted in Fig. 27 using the energy at sections I and IV, rather than the flow depths. As mentioned earlier, this substitution has been shown to be valid (Skogerboe and Hyatt, 1966). When using energy, the submerged flow discharge equation (Eq. 17) becomes

$$Q = \frac{C_1(E_1 - E_4)^{n_1}}{[-(\log E_r + C_2)]^{n_2}} \quad \ldots\ldots (27)$$

where E_r is the energy ratio E_4/E_1. Recognizing that the difference in energy is equal to the energy loss (head loss, h_L), and assuming C_2 is zero, Eq. 27 can be rewritten

$$Q = \frac{C_1 h_L^{n_1}}{(-\log E_r)^{n_2}} \quad \ldots\ldots (28)$$

The discharge equation describing nonuniform flow in the tilting flume can be developed from Fig. 27 by plotting the discharge intercept at an energy loss of 1.0 for each line of constant energy ratio. Defining the discharge intercept at $h_L = 1.0$ as denoting this with the following symbol, $Q_{h_L=1}$ and recognizing that $h_L^{n_1}$ is equal to one, when h_L is one, Eq. 28 can be reduced to

$$Q_{h_L} = 1 = \frac{C_1}{(-\log E_r)^{n_2}} \quad \ldots\ldots (29)$$

By plotting $Q_{h_L=1}$ against $-\log E_r$ on logarithmic paper, a linear relationship will result where C_1 is the value of $Q_{h_L=1}$ at $-\log E_r = 1$ and n_2 is the slope of the straight line. This relationship for the tilting flume is shown in Fig. 28. The discharge equation for nonuniform flow in the tilting flume having the roughness pattern shown in Fig. 20 is

$$Q = \frac{9.6(E_1 - E_4)^2}{(-\log E_r)^{3/2}} \quad \ldots\ldots (30)$$

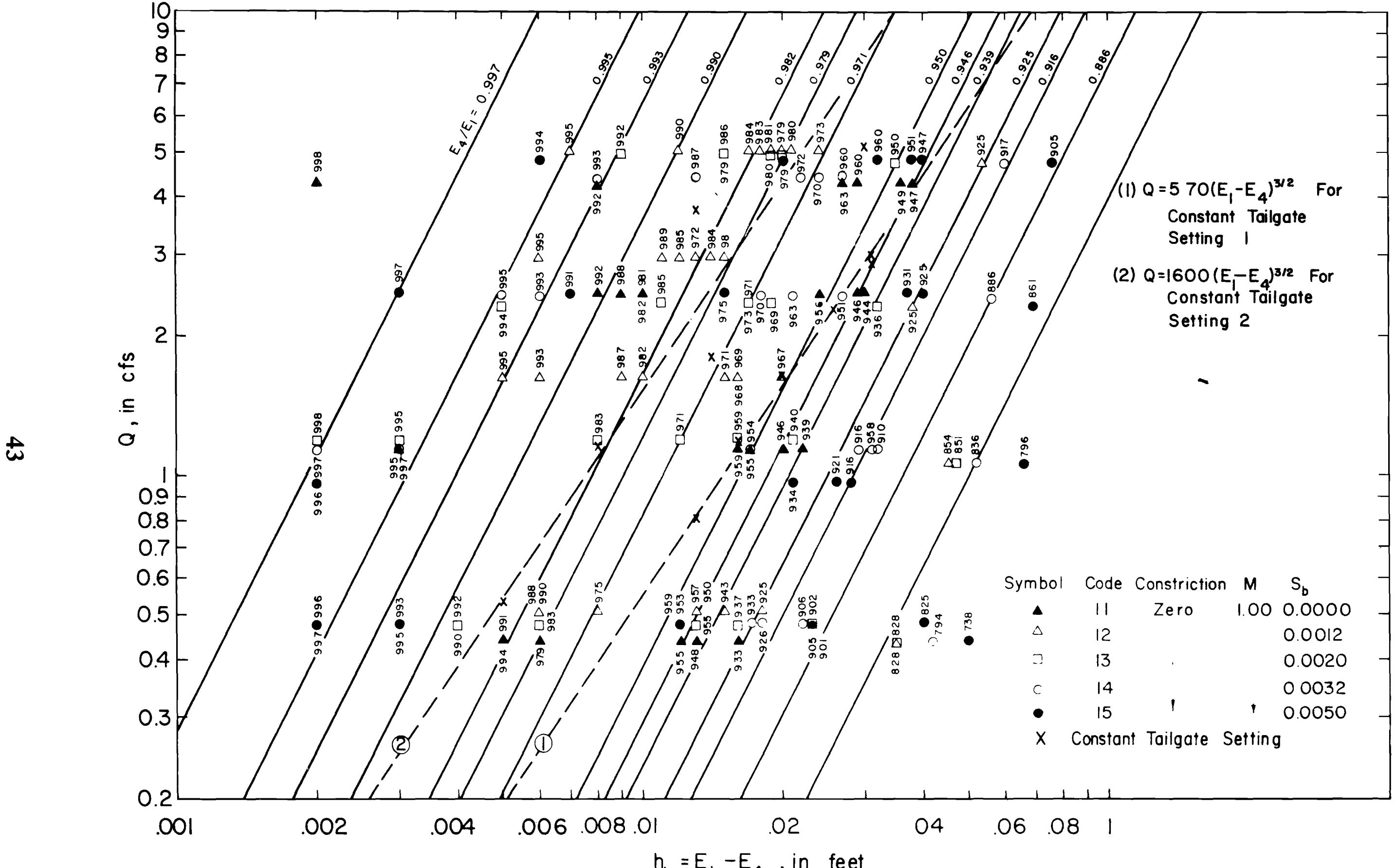

Figure 27. Plot of nonuniform flow data for tilting flume, with no constriction.

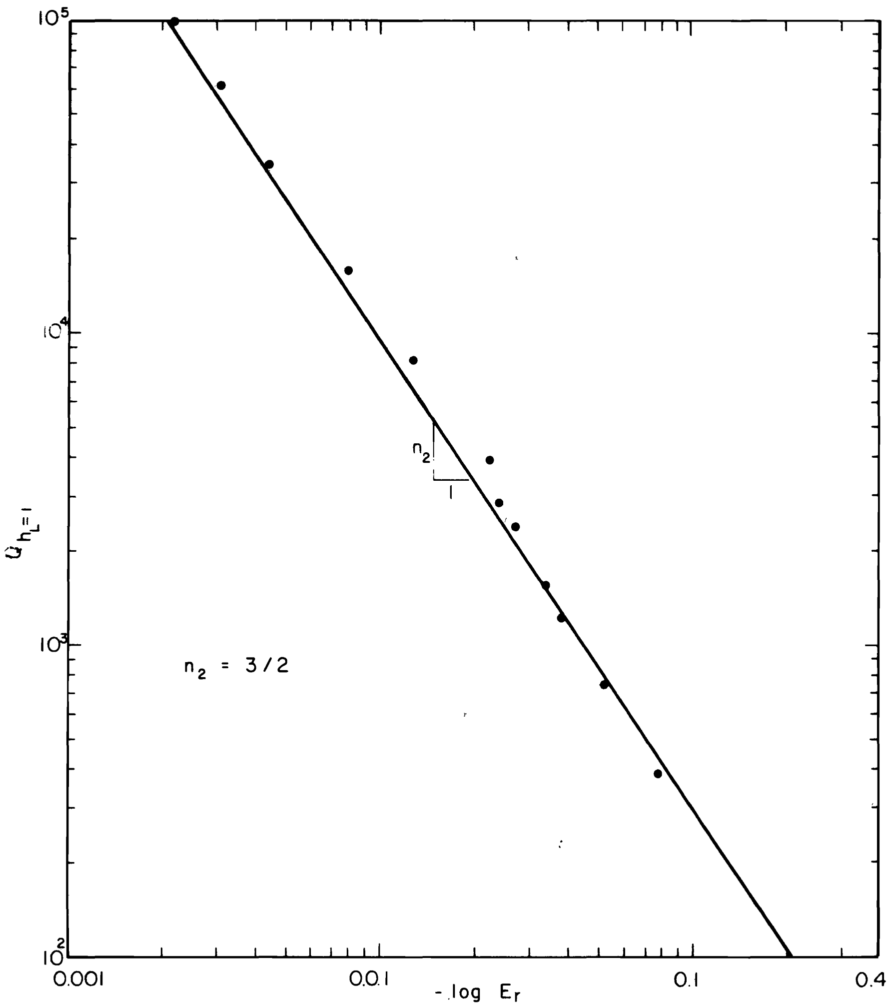

Figure 28. Energy ratio distribution for nonuniform flow in tilting flume.

The exponent $n_1 = 2$ in Eq. 30 is the slope of the lines of constant energy ratio in Fig. 27. For a rectangular open channel constriction, the expected value of n_1 is 3/2. The discharge in an open channel without a constriction is a function of the square root of the energy slope, which is $(E_1 - E_4)^{1/2}$. Therefore, for nonuniform flow in a rectangular open channel, the expected value of n_1 = 2, 3/2 + 1/2.

The subcritical flow exponent in Eq. 30 is n_2 = 3/2. Theoretically, the expected value of n_2 for zero constriction is 3/2 as shown in Fig. 29.

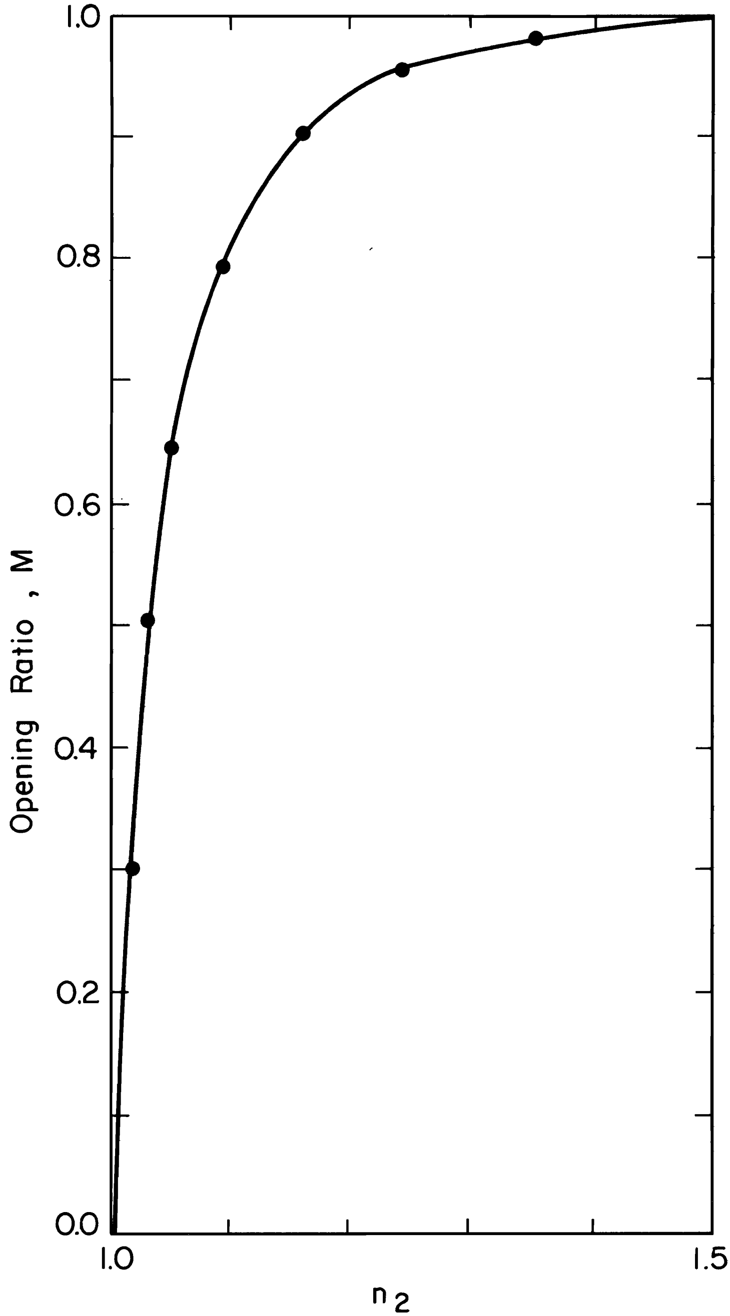

Figure 29. Theoretical relationship between opening ratio, M, and subcritical flow exponent, n_2, for open channel constrictions. (Taken from Skogerboe and Hyatt.)

DISCHARGE AT BRIDGE CONSTRICTIONS

In order to evaluate the backwater due to bridge constrictions, it is necessary to determine the discharge rating, both free flow and submerged flow, for various bridge geometries. For this study, three simple vertical board models and three 60° wingwall abutment models were selected.

The free flow ratings for the vertical board constriction are shown in Fig. 30. The free flow equations are:

$$\text{for } M = 0.245, \quad Q = 2.03E_1^{3/2} \quad \ldots\ldots(31)$$

$$\text{for } M = 0.497, \quad Q = 4.13E_1^{3/2} \quad \ldots\ldots(32)$$

$$\text{for } M = 0.733, \quad Q = 6.08E_1^{3/2} \quad \ldots\ldots(33)$$

A general free flow discharge equation can be written as

$$Q = 2.74\ bE_1^{3/2} \quad \ldots\ldots\ldots\ldots(34)$$

Although Eq. 34 is a general equation describing free flow (critical-depth flow) for the vertical board constrictions used in this study, it is recognized that the free flow coefficient would not be correct for prototype bridges due to scale effects. Also, Eq. 34 was developed for opening ratios between 1/4 and 3/4. Because it approaches the case of no constriction ($M = 1$) considerable error could be expected in projecting Eq. 34 for opening ratios larger than 3/4.

For the 60° wingwall abutment models, the free flow ratings are shown in Fig. 31. The free flow equations are:

$$\text{for } M = 0.252, \quad Q = 2.25E_1^{3/2} \quad \ldots\ldots(35)$$

$$\text{for } M = 0.502, \quad Q = 4.45E_1^{3/2} \quad \ldots\ldots(36)$$

$$\text{for } M = 0.738, \quad Q = 6.50E_1^{3/2} \quad \ldots\ldots(37)$$

A more general free flow discharge equation can be written as

$$Q = 2.97\ bE_1^{3/2} \quad \ldots\ldots\ldots\ldots(38)$$

The submerged flow ratings for the three vertical board bridge models are shown in Figs. 32, 33, and 34. From these ratings, the intercepts for each line of constant energy ratio at $h_L = 1.0$ are plotted as the ordinate in Fig. 35 against -log E_r. From the straight-line relationships in Fig. 35, and knowing from the

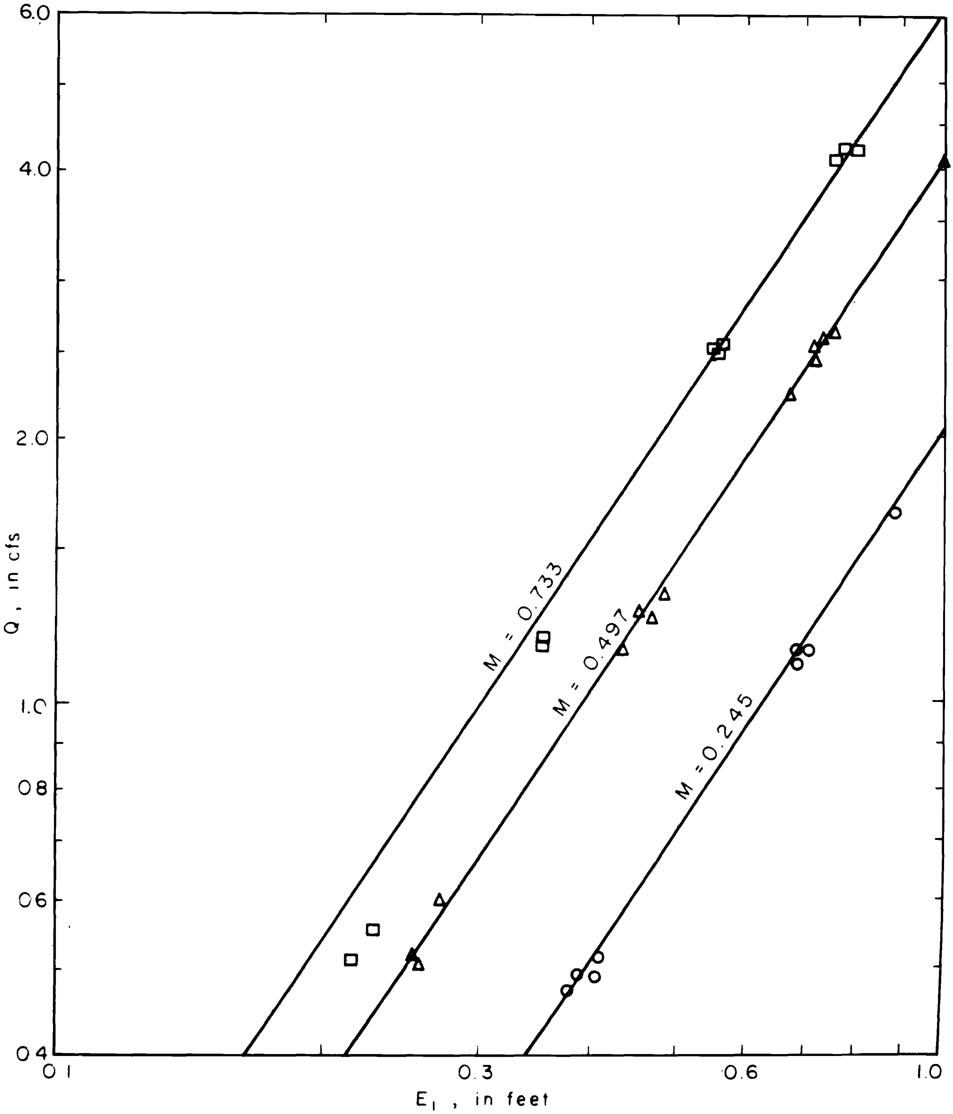

Figure 30. Free flow ratings for vertical board models.

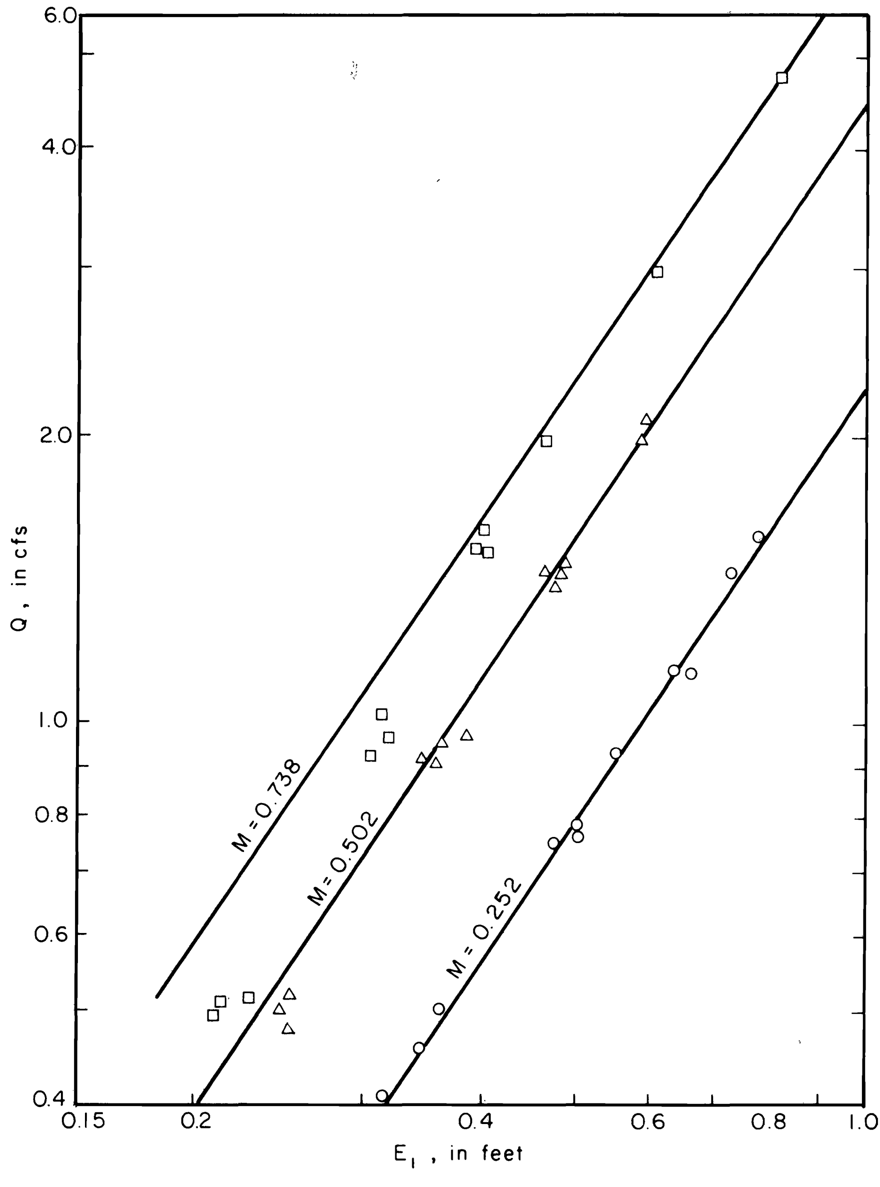

Figure 31. Free flow ratings for 60° wingwall abutment models.

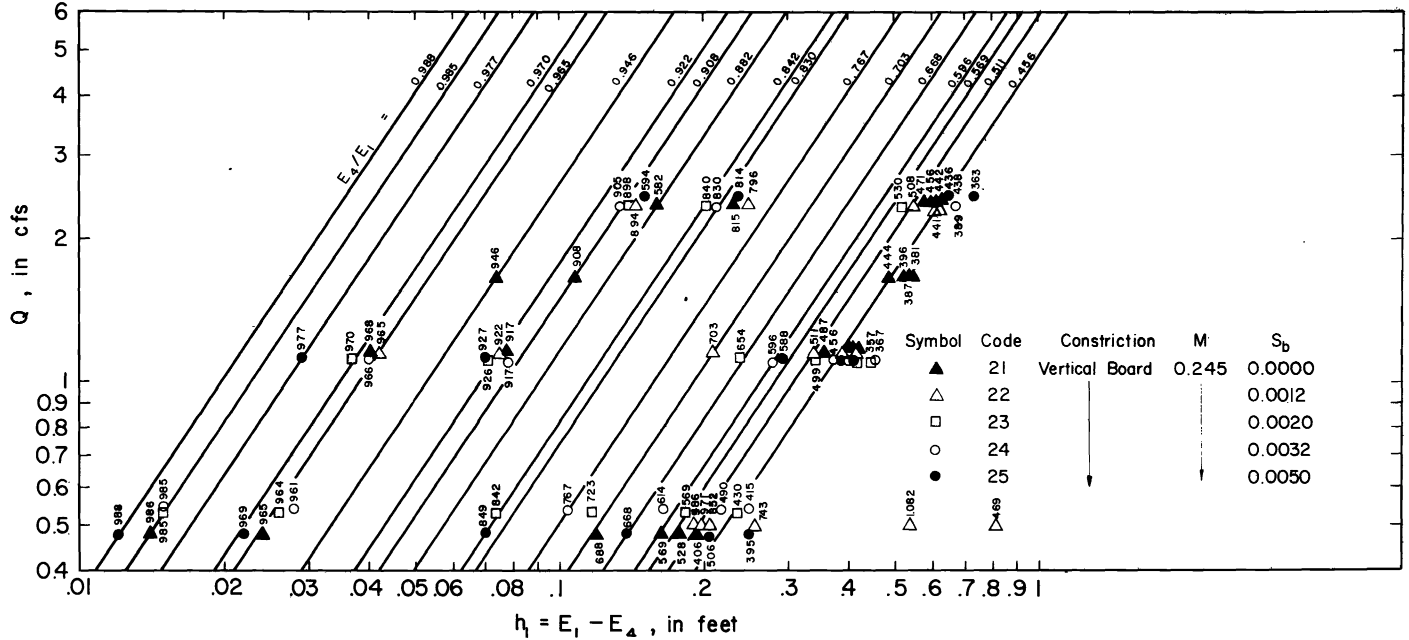

Figure 32. Submerged flow rating for vertical board bridge model with M = 0.245.

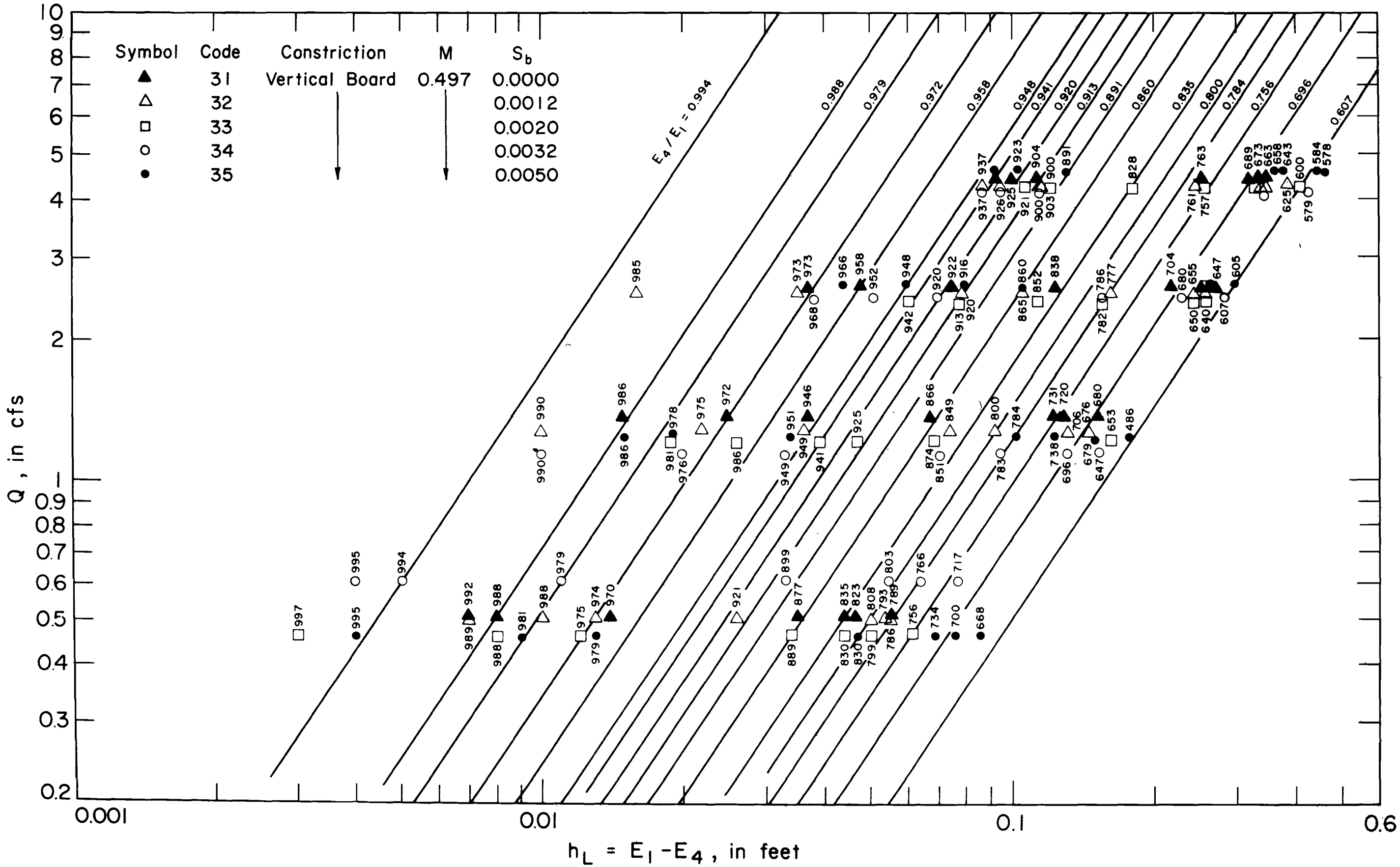

Figure 33. Submerged flow rating for vertical board bridge model with M = 0.497.

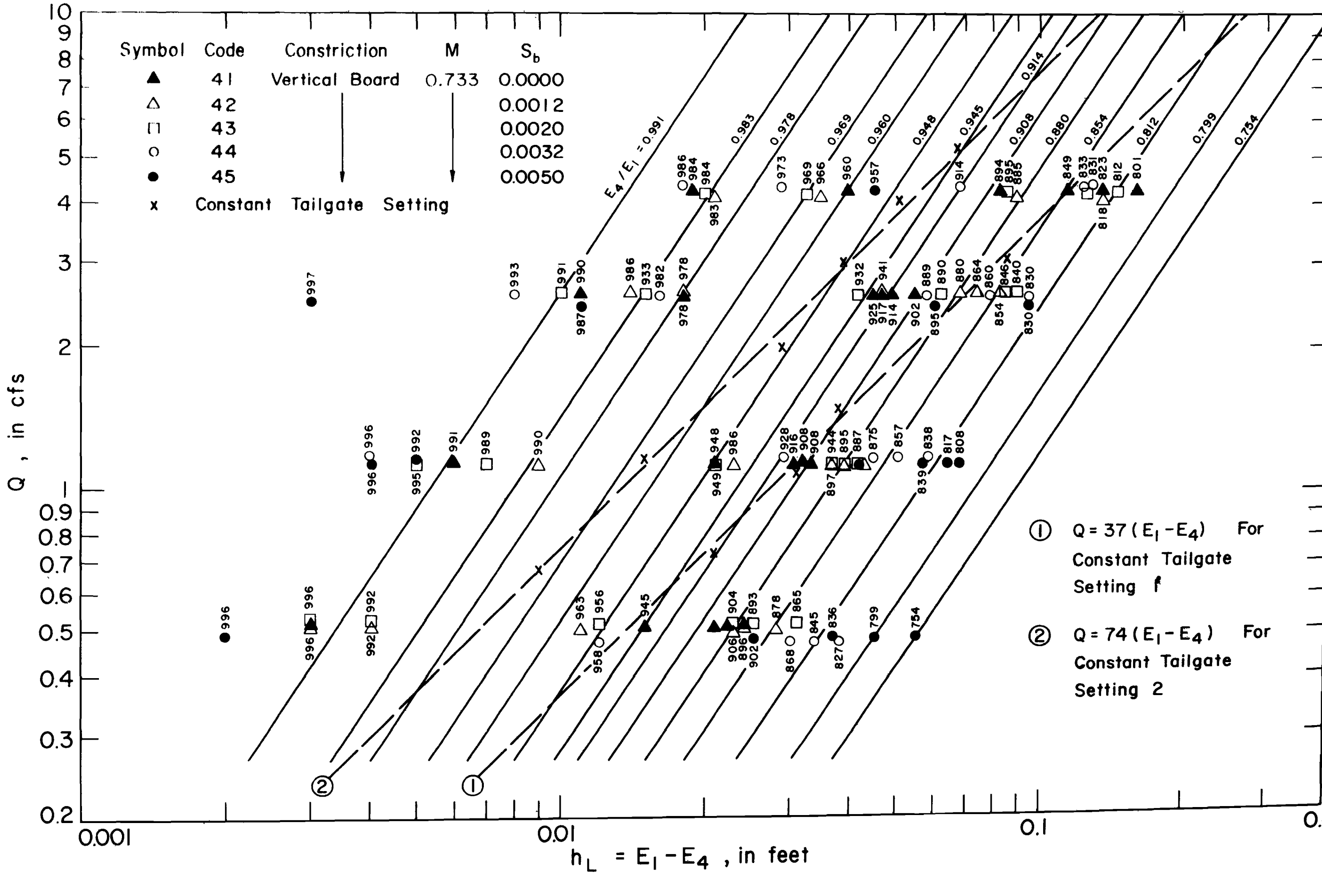

Figure 34. Submerged flow rating for vertical board bridge mdoel with M = 0.733.

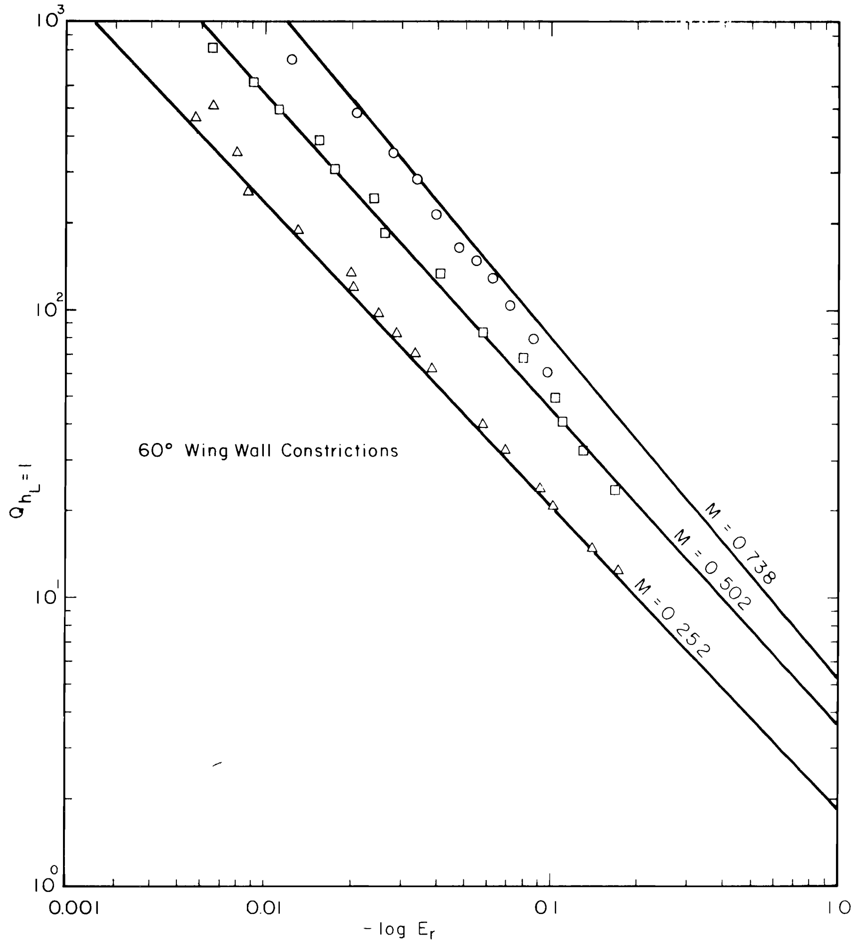

Figure 35. Distribution of constant energy ratio for three vertical board bridge models.

free flow ratings (Fig. 30) that n_1 is 3/2, the submerged flow discharge equations are:

$$\text{for } M = 0.245, \quad Q = \frac{1.64(E_1 - E_4)^{3/2}}{(-\log E_r)^{1.05}} \quad \ldots .(39)$$

$$\text{for } M = 0.497, \quad Q = \frac{3.33(E_1 - E_4)^{3/2}}{(-\log E_r)^{1.09}} \quad \ldots .(40)$$

$$\text{for } M = 0.733, \quad Q = \frac{4.91(E_1 - E_4)^{3/2}}{(-\log E_r)^{1.16}} \quad \ldots .(41)$$

A more general submerged flow discharge equation for the vertical board models can be written as

$$Q = \frac{2.22\ b\ (E_1 - E_4)^{3/2}}{(-\log E_r)^{n_2}} \quad . . . . (42)$$

where n_2 is obtained from Fig. 36. By setting the free flow equations equal to the submerged flow equations, the transition energy ratio, E_{rt}, can be determined by trial and error. For example, the transition energy ratio for an opening ratio of 0.245 would be computed by setting Eq. 31 equal to Eq. 39. Following this procedure, the transition energy ratios are 0.575, 0.717, and 0.860 for opening ratios of 0.245, 0.497, and 0.733, respectively.

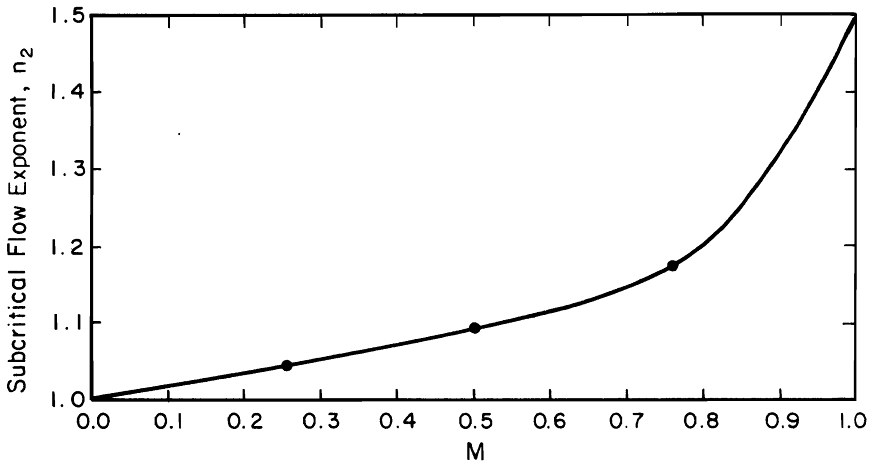

Figure 36. Variation of submerged flow exponent with opening ratio for vertical board and 60° wingwall abutment bridge models.

For the 60° wingwall abutment bridge models, the submerged flow ratings are shown in Figs. 37, 38, and 39. From these ratings, the intercept at $h_L = 1.0$ for each line of constant energy ratio has been plotted against $-\log E_r$ in Fig. 40. The lines of constant energy ratio in Figs. 37, 38, and 39 have been drawn at a slope of 3/2, which corresponds with the value of the free flow exponent. From the straight-line relationships in Fig. 40, the submerged flow discharge equations become:

$$\text{for } M = 0.252, \qquad Q = \frac{1.84\ (E_1 - E_4)^{3/2}}{(-\log E_r)^{1.05}} \quad . . . (43)$$

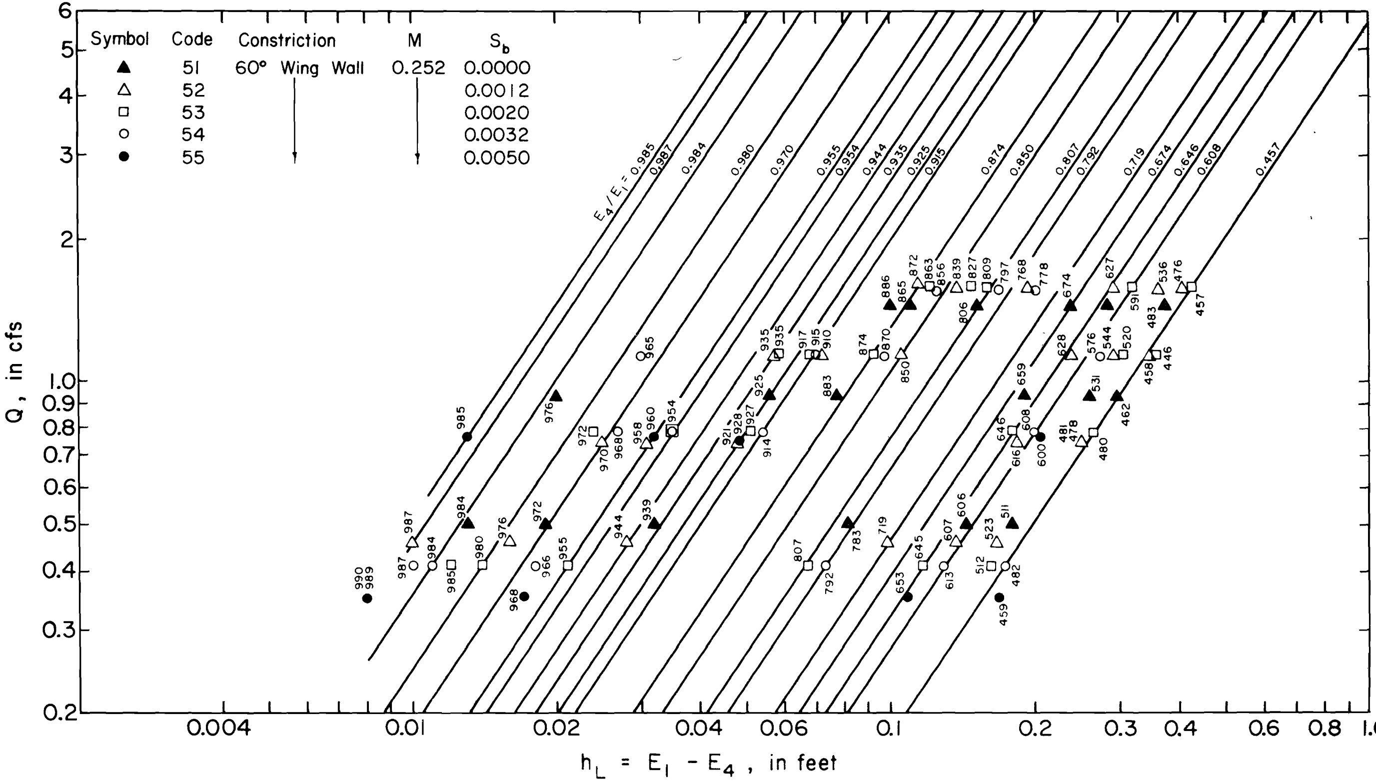

Figure 37. Submerged flow rating for 60° wingwall abutment bridge model with M = 0.252.

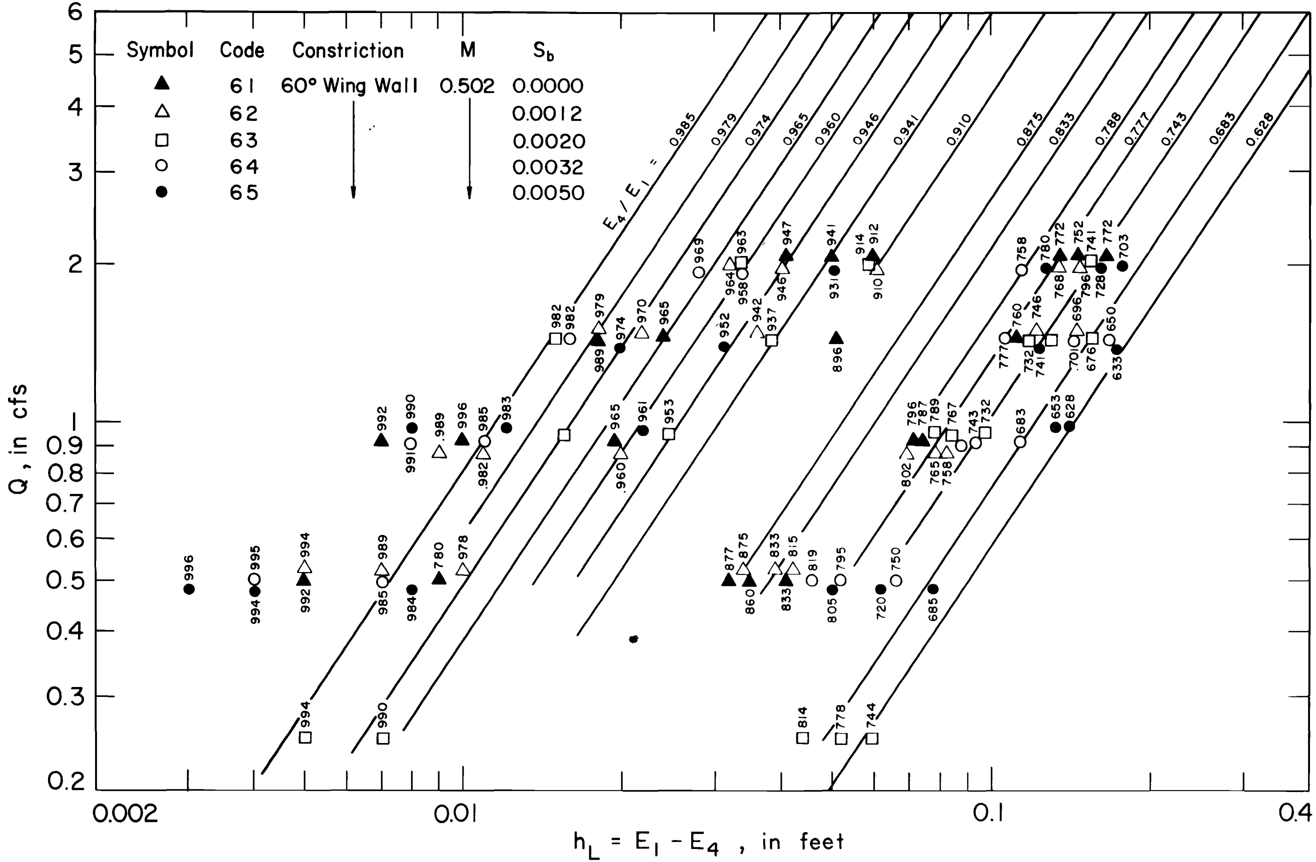

Figure 38. Submerged flow rating for 60° wingwall abutment bridge model with M = 0.502.

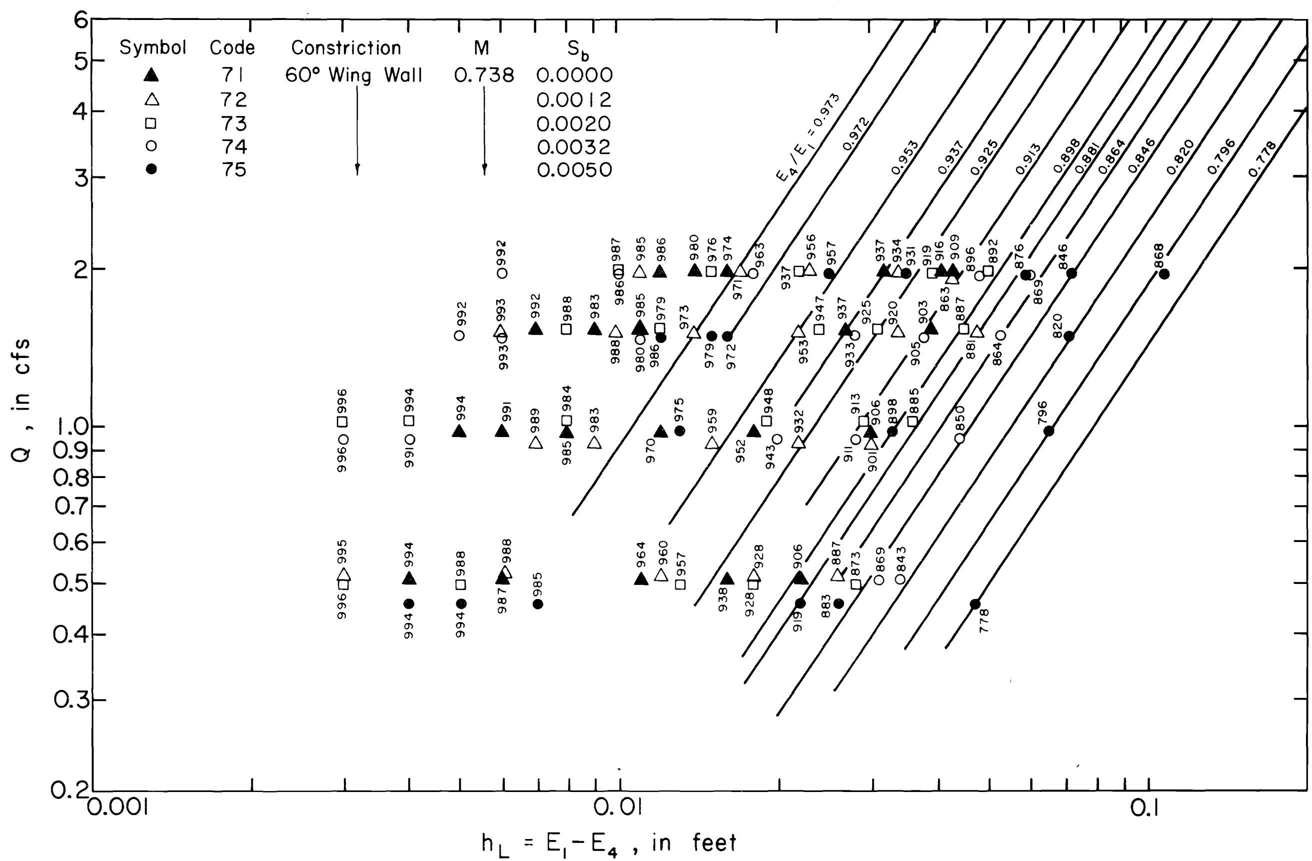

Figure 39. Submerged flow rating for 60° wingwall abutment bridge model with M = 0.738.

$$\text{for } M = 0.502, \quad Q = \frac{3.66\,(E_1 - E_4)^{3/2}}{(-\log E_r)^{1.09}} \quad \text{. .(44)}$$

$$\text{for } M = 0.738, \quad Q = \frac{5.39\,(E_1 - E_4)^{3/2}}{(-\log E_r)^{1.16}} \quad \text{. .(45)}$$

Of particular importance in the above equation is that the submerged flow exponents are compatible to the values in Eqs. 39, 40, and 41. Thus, the

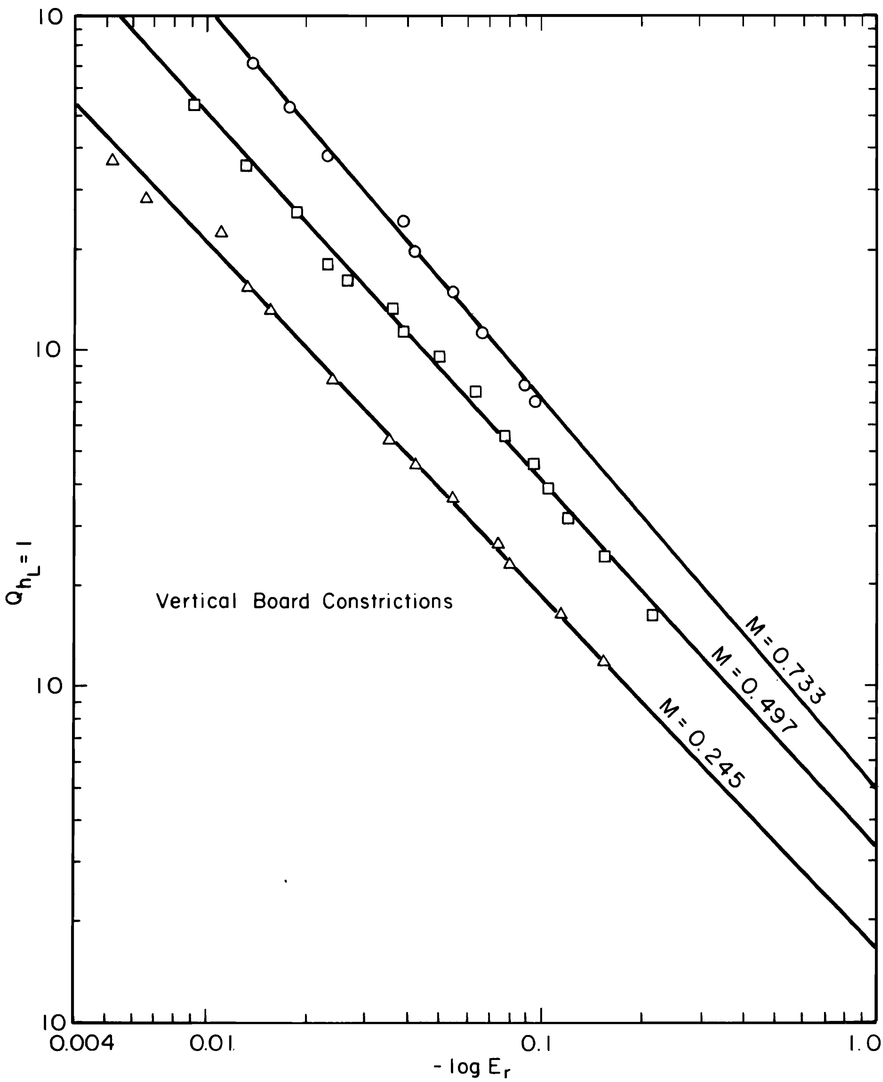

Figure 40. Distribution of constant energy ratio for three 60° wingwall abutment bridge models.

variation of the submerged flow exponent with opening ratio shown in Fig. 36 is valid for both the vertical board and 60° wingwall abutment bridge models. A more general submerged flow discharge equation for the 60° wingwall abutment bridge models can be written as

$$Q = \frac{2.42\ b\ (E_1 - E_4)^{3/2}}{(-\log E_r)^{n_2}} \quad \ldots\ldots\ldots (46)$$

where n_2 is obtained from Fig. 36. By setting the free flow equation for each bridge model equal to the submerged flow equation for the same model, the transition energy ratios, E_{rt}, are 0.616, 0.741, and 0.871 for opening ratios of 0.252, 0.502, and 0.738, respectively.

BACKWATER ANALYSIS

Now that the groundwork has been laid in the previous chapters, it is possible to discuss the various flow conditions under which backwater can occur, along with the technique for analyzing or computing the backwater for each flow condition. The base from which the backwater is computed is the depth of flow in the river channel prior to placement of the bridge constriction. Now, either uniform flow or nonuniform flow conditions could have existed in the river channel prior to construction of the bridge. After placement of the constriction, either free flow or submerged flow can occur in the constriction. Thus, there are two flow conditions that could have been encountered in the river channel, along with two different flow conditions at the constriction, thereby resulting in four possible combinations for which the backwater analysis would be different for each combination.

In the paragraphs that follow, the backwater analysis will be described using flow depths. The nonuniform channel resistance, along with the free flow and submerged flow ratings, have been reported herein using the energy above a particular datum for each flow cross-section. The descriptions of backwater analysis that follow could just as well have incorporated the energy at sections I and IV (Fig. 1) instead of the flow depths at these sections.

Uniform Flow and Free Flow

The simplest case would involve uniform flow in the river channel prior to construction of the bridge and with critical depth occurring in the constriction. Either Manning's or Chezy's equation would be used to compute normal flow depth, y_n, for the design discharge. The primary difficulty in using either of these equations is selecting a resistance coefficient. If the free flow rating for the bridge constriction is known, then the upstream flow depth, y_1, can be computed directly for the design discharge. The backwater is then the difference between y_1 and y_n.

Uniform Flow and Submerged Flow

With uniform flow existing in the river channel before constriction of the bridge, but with submerged flow occurring at the constriction, the backwater must be computed by a trial and error procedure. Again, the normal flow depth, y_n, can be computed from either Manning's or Chezy's equation. Now, in order to compute the flow depth upstream from the bridge constriction, the normal flow depth is substituted for the downstream flow depth, y_4. Entering the submerged flow rating curves along the ordinate for the design discharge, there is only one unique point for which the change in water surface elevation, $y_1 - y_4$, and the submergence, y_4/y_1, will yield the normal flow depth, y_n, which is also the value of y_1. This unique point would have to be found by trial and error. Once this point is found, the value of y_1 can be computed and the backwater will be $y_1 - y_n$. For this particular case, abscissa of the submerged flow rating, $y_1 - y_4$, is also the backwater, y_1^*. When the change in energy, $E_1 - E_4$, is plotted, the abscissa is also the energy backwater, E_1^*. The backwater analysis could be accomplished on a computer by using the submerged flow discharge equation. Values of y_1 would have to be assumed and the correct value of y_1 would be arrived at by an iterative procedure.

When nonuniform flow conditions occur in the river channel prior to construction of the bridge, two techniques are available for arriving at the flow depths upstream and downstream from the proposed bridge site. The common technique is to begin at a point somewhere along the river where the stage-discharge relation is known. Then, the desired flow depths can be computed by the usual procedures involving M1 backwater curves. The second technique involves the nonuniform flow resistance procedure discussed in the section, "Channel Resistance." The nonuniform flow resistance curves are similar to the submerged flow rating curves for a constriction. Thus, knowing the design discharge and one of the flow depths (either the flow depth upstream or downstream from the site of the proposed bridge), the other flow depth can be determined by the same trial and error procedure described above when submerged flow conditions occur in a bridge constriction. Here, the difficulty is knowing one of the flow depths, which may have to be computed using one of the common techniques for analyzing M1 backwater curves, but starting at a point of known flow depth for the design discharge either upstream or downstream from the bridge.

Nonuniform Flow and Free Flow

For the case where nonuniform flow conditions existed prior to constriction, the flow depths upstream and downstream prior to construction of the bridge would be established using one of the techniques described above. The upstream flow depth, y_1, after construction can be determined directly for the design discharge by using the free flow rating curve or the free flow discharge equation.

Nonuniform Flow and Submerged Flow

The most difficult case would occur when nonuniform flow would occur in the river channel if the bridge constriction were not present and then, submerged flow occurs in the constriction. In this case, the flows depths that would have occurred upstream and downstream from the bridge were it not present must be established using one of the techniques described above. The downstream flow depth, y_4, is the same before and after placement of the bridge. The upstream flow depth, y_1, due to submerged flow in the bridge constriction must be obtained by the trial and error procedure described above for the case of submerged flow, but with uniform flow prior to construction. Again, the backwater is the difference between the two computed upstream flow depths.

Special Cases

Most of the research regarding backwater at bridge constrictions (e.g. Kindsvater and Carter, 1955, and Liu, Bradley, and Plate, 1957) has involved a special case of submerged flow at the constriction, along with uniform flow in the river channel prior to construction of the bridge. The laboratory data for this special case is collected by establishing uniform flow in a tilting flume and then placing the model bridge constriction in the flume and measuring the increased flow depth upstream from the model bridge. For this case the control is at the constriction, not in the downstream section. Very little data have been collected for the abnormal stage-discharge condition. The data that have been reported by others, involve a special case of constant downstream control.

To test the effect of a constant downstream control, a series of experiments were conducted using the tilting flume and the vertical board bridge model having an opening ratio of 0.733. All tests were run with a fixed bed slope of 0.0020. First, uniform flow was established for an intermediate discharge. Then, a M1 backwater curve was created by lowering the discharge. Flow depth measurements at the 6-foot (y_1) and 18-foot (y_4) sections were collected, along with the discharge. Next, the discharge was decreased another small increment and the flow depths and discharge were again measured. This process was continued for a series of discharge values.

After collecting the above nonuniform flow data, and with the tailgate setting remaining fixed, the vertical board constriction was placed in the flume. Then, a series of discharge values were again used and the corresponding flow depths measured.

After collecting data for the first constant tailgate setting, which included nonuniform flow data for both the flume and the constriction, the bridge model was removed and uniform flow was established for a high discharge. Then, a M1 backwater curve was created by lowering the flow rate, and the discharge and corresponding flow depths were measured. The discharge was decreased in a series of small increments with the flow depths being measured for each discharge. Next, the bridge model was again placed in the flume and a set of data was collected for nonuniform flow conditions, but with the tailgate setting remaining fixed.

The above nonuniform flow data for the tilting flume with two constant tailgate settings are plotted in Fig. 27, while the similar data for the bridge model are shown in Fig. 34. For the first constant tailgate setting,

$$\text{for } M = 1.00, \quad Q = 570\ (E_1 - E_4)^{3/2} \quad \ldots\ldots (47)$$

$$\text{for } M = 0.733, \quad Q = 37\ (E_1 - E_4) \quad \ldots\ldots (48)$$

For the second constant tailgate setting,

$$\text{for } M = 1.00, \quad Q = 1600\ (E_1 - E_4)^{3/2} \quad \ldots\ldots (49)$$

$$\text{for } M = 0.733, \quad Q = 74\,(E_1 - E_4) \quad \ldots\ldots\ldots (50)$$

The above equations are plotted in Fig. 41. For each constant tailgate setting, the energy backwater, E_1^*, is the difference between the curves plotted in Fig. 41a or Fig. 41b. For this special case of the abnormal stage-discharge condition, the exponents in the above equations (Eqs. 47, 48, 49, and 50) are exactly 1/2 less than the exponents in the general equations (Eqs. 30 and 41).

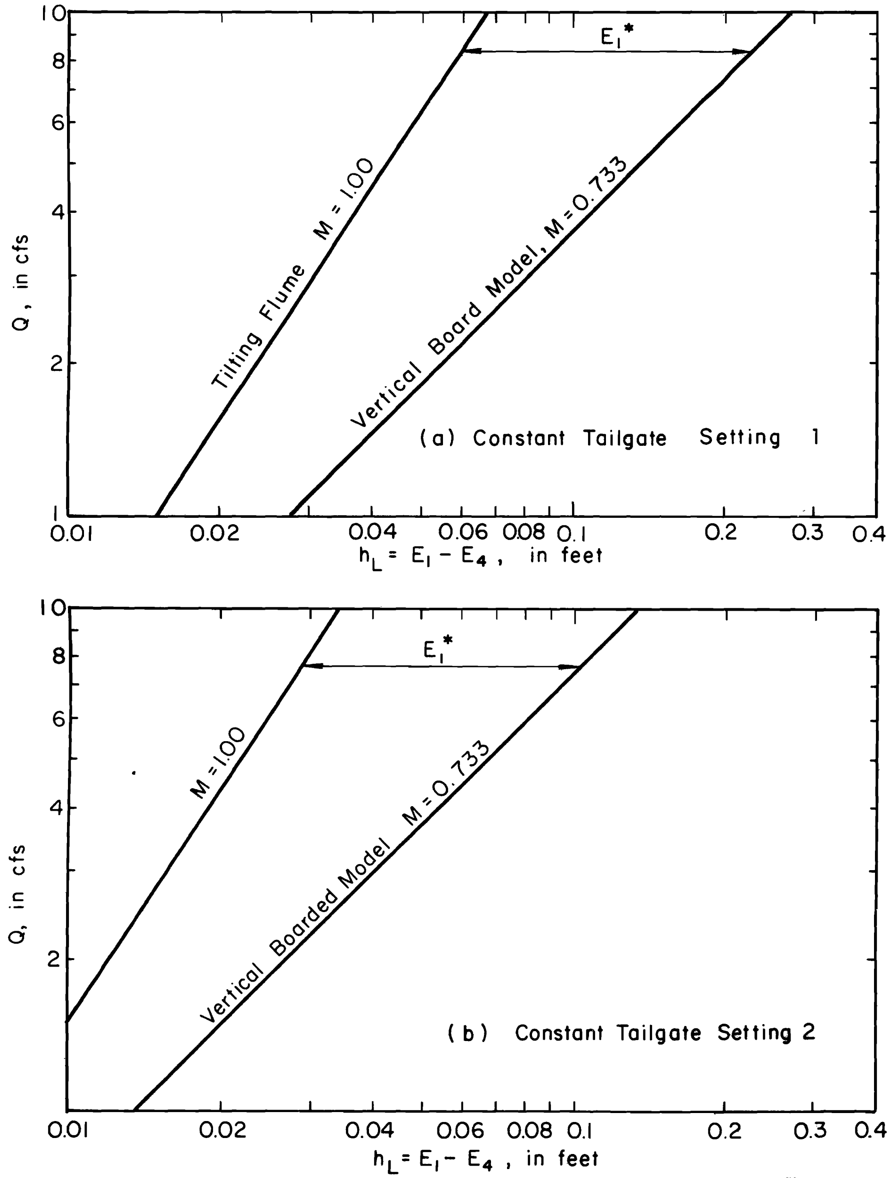

Figure 41. Energy backwater for special cases of abnormal stage-discharge condition.

SUMMARY

The primary intent of this research effort has been to develop a method of backwater analysis under abnormal stage-discharge conditions. The present design manual (Bradley, 1960) regarding hydraulics of bridged waterways gives only an approximate backwater solution for abnormal stage-discharge conditions. In fact, the statement is made that "This is a case where it is more important to understand the problem than to attempt precise computations." Also, an ASCE (1966) task committee, as one of 12 recommendations, stated that it may be possible to derive experimental data which would simplify the procedure for analyzing backwater due to bridge constrictions under abnormal stage-discharge conditions.

The flow resistance technique reported by Overton (1967) was used to analyze the uniform flow data collected in the tilting flume used in this study. The roughness parameter, y_s, was determined for each of the four bed slopes 0.0012, 0.0020, 0.0032, and 0.0050. From a composite analysis, the roughness parameter was determined to be 0.030 feet and the Chezy resistance coefficient was 68. From a similar analysis using Manning's equation, the roughness parameter was still 0.030 feet. For the range of discharges and flow depths used in this study, the Manning roughness coefficient, n, is about 0.019. The total height of the roughness pattern was 0.041 feet and consisted of 1/4 inch diameter smooth rod located every 6 inches longitudinally and 9 inches transversely. Thus, the effective bed level is below the top of the roughness pattern.

In order to evaluate backwater due to bridge constrictions under abnormal stage-discharge conditions, it becomes necessary to develop the nonuniform flow relationship for the channel (in this study a tilting flume 3.02 feet wide was used) without any constriction (zero constriction case). In all cases under this investigation, the water surface profiles for nonuniform flow conditions were M1 backwater curves. For the tilting flume used in this study, the nonuniform discharge equation is

$$Q = \frac{9.6(E_1 - E_4)^2}{(-\log E_r)^{3/2}} \quad \text{. . . . . (30)}$$

Thus, the above equation is similar to the equation previously developed at Utah State University (Skogerboe and Hyatt, 1967a, 1967b) to describe subcritical flow at open channel constrictions.

The bridge constrictions selected for study were the vertical board and 60° wingwall abutment. For each bridge geometry, opening ratios, M(M = b/B for rectangular constrictions where b is the constriction width and B is the channel width), of approximately 1/4, 1/2, and 3/4 were used. In each case, both free flow and submerged flow ratings were developed.

In analyzing the backwater due to the placement of a bridge constriction in a river channel, four combinations of flow conditions are possible. Prior to construction of the bridge, either uniform or nonuniform flow conditions could have prevailed in the river channel. After placement of the bridge, either free flow or submerged flow conditions will occur at the constriction. Normally, free flow conditions at bridged waterways would be avoided because of the scour potential because of supercritical velocities.

A comparison of the free flow rating for a constriction with uniform flow conditions in the main channel yields the "contraction backwater." The free flow rating, or free flow discharge equation, can be used to determine the flow depth, y_1, at section I (maximum flow depth) upstream from the bridge. Chezy's equation can be used to compute the normal flow depth, y_n, for the design discharge. The backwater, y_1^*, is the difference between these two flow depths ($y_1^* = y_1 - y_n$).

A comparison can be made between the submerged flow rating for a constriction with uniform flow conditions in the main channel to determine the "resistance backwater." In this case, the flow depths at sections I and IV (upstream and downstream from the bridge) must be analyzed. The downstream flow depth, y_4, will be equal to the normal flow depth, y_n. The abscissa of the submerged flow rating, $y_1 - y_4$ or $E_1 - E_4$, will then be the backwater, y_1^*, or energy backwater, E_1^*, respectively. The backwater will be determined by a trial and error procedure using either the submerged flow rating or the submerged flow discharge equation.

Whenever the backwater is computed using nonuniform flow conditions in the river channel as a base, the term "abnormal stage-discharge backwater" would be used, but either free flow or submerged flow conditions could exist at the constriction. Therefore, the backwater analysis is dependent upon the type of flow condition prevailing at the bridge.

For the case in which nonuniform flow occurs in the river channel at design discharge without the bridge and free flow occurs with the bridge constriction, the upstream flow depth, y_1, with the bridge can be determined from the free flow rating or free flow discharge equation. The upstream flow depth, y_1, without the bridge would probably be determined using one of the computational techniques for backwater curves beginning at a flow cross-section having a known stage-discharge relationship.

The most complicated case involves nonuniform flow in the main channel prior to construction of the bridge and submerged flow at the bridge after construction. In this case, the downstream flow depth, y_4, prior to construction would be determined by one of the computational techniques for backwater curves beginning at a point of known flow depth at design discharge. Then, the upstream flow depth, y_1, could be determined by a trial and error solution of the nonuniform flow rating at the bridge site or nonuniform flow discharge equation. The downstream flow depth, y_4, will be the same with or without the bridge. Thus, the upstream flow depth with the bridge in place can be determined from a trial and error solution of the submerged flow rating or submerged flow discharge equation. The backwater, y_1^*, is the difference between the two upstream flow depths.

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APPENDIX

DEFINITION OF CODE

Example of Code Number 1512

1st digit refers to constriction or M value for a given constriction for data in tilting flume where:

1 refers to no constriction	
2 refers to vertical board constriction	M = 0.245
3 refers to vertical board constriction	M = 0.497
4 refers to vertical board constriction	M = 0.733
5 refers to 60^{o} wingwall constriction	M = 0.252
6 refers to 60^{o} wingwall constriction	M = 0.502
7 refers to 60^{o} wingwall constriction	M = 0.738

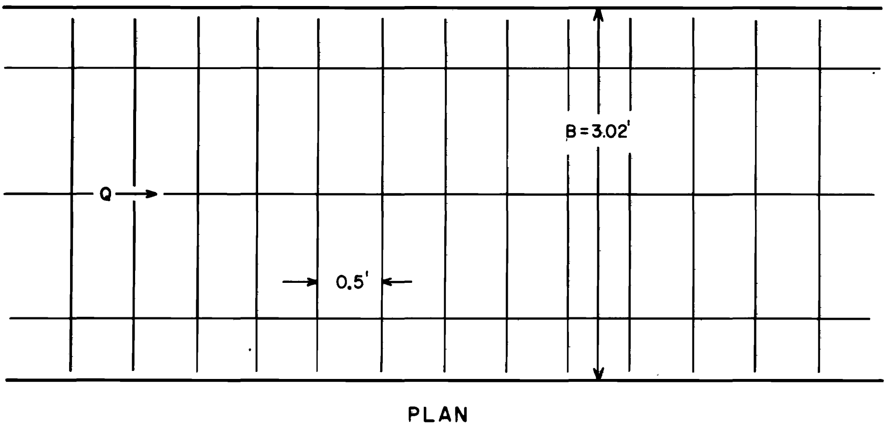
2nd digit refers to the bed slope used where:

1 refers to a slope of	0.0000
2 refers to a slope of	0.0012
3 refers to a slope of	0.0020
4 refers to a slope of	0.0032
5 refers to a slope of	0.0050

3rd and 4th digits refer to the run number for each constriction or change in bed slope.

NOMENCLATURE

Symbol	Definition
STAT	station in a downstream direction where STAT 6.0, for example, is 6 feet from the flow entrance
DPTH	measured depth before 0.03 ' correction use in data with constriction
ENGY	energy $y + V^2/2g + Z$ computed from actual depth measurement
ERGY	energy $y + V^2/2g + Z$ computed from a corrected depth value obtained by linear regression of the water surface points
DIFF	ENGY-ERGY



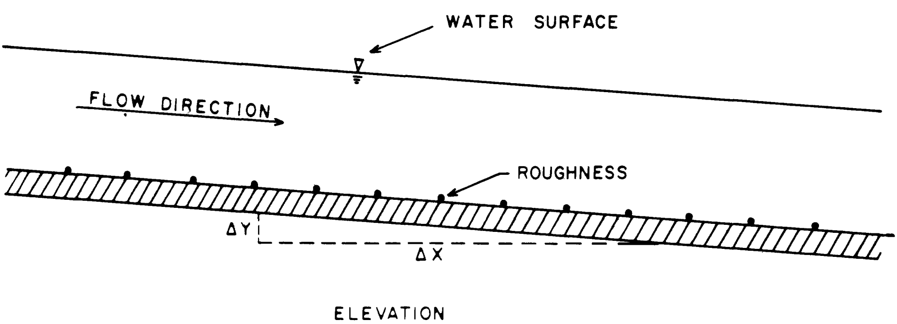


Figure 42. Definition sketch for no constriction with bar roughness shown.

Table 1. Hydraulic data for tilting flume with no constriction and with slope varying from 0.0000 to 0.0050.

CODE	STAT	6	8	10	12	14	16	18
1101	DPTH	.232	.230	.226	.224	.222	.216	.215
	ENGY	.238	.236	.232	.231	.229	.223	.222
	DIFF	-.000	.000	-.000	.000	.001	-.002	.000
	ERGY	.239	.236	.233	.230	.227	.225	.222
1102	DPTH	.240	.240	.236	.234	.236	.227	.227
	ENGY	.246	.246	.242	.240	.242	.233	.233
	DIFF	-.001	.001	-.000	-.000	.004	-.003	-.000
	ERGY	.247	.245	.242	.240	.238	.236	.234
1103	DPTH	.259	.258	.251	.254	.251	.247	.247
	ENGY	.264	.263	.256	.259	.256	.252	.252
	DIFF	.000	.001	-.003	.002	.000	-.001	.000
	ERGY	.264	.262	.260	.258	.256	.254	.252
1104	DPTH	.276	.276	.274	.274	.272	.267	.269
	ENGY	.280	.280	.278	.278	.276	.272	.274
	DIFF	-.000	.000	-.000	.001	.000	-.003	.000
	ERGY	.281	.280	.278	.277	.276	.274	.273
1105	DPTH	.529	.529	.527	.528	.525	.523	.524
	ENGY	.530	.530	.528	.529	.526	.524	.525
	DIFF	-.000	.000	-.000	.002	-.000	-.001	.000
	ERGY	.531	.530	.529	.528	.527	.526	.525
1106	DPTH	.784	.785	.783	.784	.781	.778	.779
	ENGY	.785	.786	.784	.785	.782	.779	.780
	DIFF	-.001	.000	-.000	.002	.000	-.002	.000
	ERGY	.786	.785	.784	.783	.781	.780	.779
1107	DPTH	.342	.339	.333	.331	.328	.320	.318
	ENGY	.361	.358	.353	.351	.348	.341	.339
	DIFF	-.000	.000	-.001	.000	.002	-.002	.000
	ERGY	.361	.357	.354	.350	.347	.343	.339
1108	DPTH	.352	.350	.345	.343	.339	.332	.330
	ENGY	.370	.368	.363	.361	.358	.352	.350
	DIFF	-.000	.000	-.000	.001	.001	-.002	.000
	ERGY	.371	.367	.364	.360	.357	.353	.350
1109	DPTH	.365	.363	.358	.357	.351	.347	.346
	ENGY	.381	.379	.375	.374	.369	.365	.364
	DIFF	-.000	.000	-.000	.002	-.000	-.001	.000
	ERGY	.382	.379	.376	.373	.369	.366	.363
1110	DPTH	.376	.375	.370	.368	.365	.358	.358
	ENGY	.391	.390	.386	.384	.381	.375	.375
	DIFF	-.000	.001	-.000	.000	.001	-.002	.000
	ERGY	.392	.389	.386	.383	.380	.377	.374
1111	DPTH	.626	.625	.625	.627	.624	.622	.623
	ENGY	.632	.631	.631	.633	.630	.628	.629
	DIFF	-.000	-.000	-.000	.002	-.000	-.001	.000
	ERGY	.632	.631	.631	.630	.630	.629	.628
1112	DPTH	.858	.856	.858	.858	.454	.853	.855
	ENGY	.861	.859	.861	.861	.465	.856	.858
	DIFF	.014	.027	.043	.058	-.324	.082	.099
	ERGY	.847	.832	.818	.803	.788	.774	.759

Table 1. Continued.

1113	DPTH	.491	.488	.482	.477	.471	.461	.453
	ENGY	.534	.532	.527	.523	.518	.510	.504
	DIFF	-.002	.000	.000	.002	.002	-.000	-.002
	ERGY	.537	.532	.526	.521	.516	.511	.506
1114	DPTH	.500	.495	.490	.485	.479	.472	.464
	ENGY	.542	.538	.534	.530	.525	.519	.513
	DIFF	-.000	-.000	.000	.001	.000	.000	-.001
	ERGY	.543	.538	.533	.528	.524	.519	.514
1115	DPTH	.508	.507	.501	.499	.490	.482	.480
	ENGY	.549	.548	.543	.541	.534	.527	.525
	DIFF	-.002	.001	.000	.003	-.000	-.002	.000
	ERGY	.551	.547	.542	.538	.534	.529	.525
1116	DPTH	.501	.501	.513	.507	.502	.495	.489
	ENGY	.543	.543	.553	.548	.544	.538	.533
	DIFF	-.005	-.004	.008	.005	.002	-.002	-.005
	ERGY	.548	.546	.545	.543	.541	.539	.538
1117	DPTH	.763	.759	.759	.758	.754	.753	.754
	ENGY	.781	.777	.777	.776	.772	.771	.772
	DIFF	.001	-.001	.000	.000	-.001	-.000	.001
	ERGY	.780	.778	.777	.775	.774	.772	.771
1118	DPTH	1.003	1.001	1.003	1.002	.999	.994	.994
	ENGY	1.013	1.011	1.013	1.012	1.009	1.005	1.005
	DIFF	-.001	-.002	.002	.003	.001	-.002	-.000
	ERGY	1.015	1.013	1.011	1.010	1.008	1.007	1.005
1119	DPTH	.633	.638	.623	.612	.610	.596	.583
	ENGY	.711	.715	.704	.696	.694	.684	.675
	DIFF	-.005	.005	.000	-.001	.004	-.000	-.003
	ERGY	.716	.710	.703	.697	.691	.684	.678
1120	DPTH	.645	.643	.627	.624	.621	.603	.593
	ENGY	.720	.719	.707	.704	.702	.689	.682
	DIFF	-.002	.003	-.003	.001	.005	-.001	-.002
	ERGY	.723	.716	.710	.703	.697	.691	.684
1121	DPTH	.652	.650	.638	.634	.626	.619	.616
	ENGY	.726	.724	.715	.712	.706	.701	.699
	DIFF	-.000	.003	-.002	.000	-.000	-.001	.002
	ERGY	.726	.722	.717	.712	.707	.702	.697
1122	DPTH	.662	.653	.653	.649	.639	.632	.624
	ENGY	.733	.726	.726	.723	.716	.710	.704
	DIFF	-.000	-.003	.002	.003	.000	-.000	-.002
	ERGY	.734	.729	.725	.720	.715	.711	.706
1123	DPTH	.885	.893	.885	.878	.879	.874	.876
	ENGY	.925	.932	.925	.919	.920	.915	.917
	DIFF	-.004	.006	.000	-.003	.000	-.002	.002
	ERGY	.929	.926	.924	.922	.919	.917	.915
1124	DPTH	1.119	1.127	1.120	1.118	1.119	1.110	1.117
	ENGY	1.144	1.152	1.145	1.143	1.144	1.135	1.142
	DIFF	-.004	.005	-.000	-.000	.002	-.005	.003
	ERGY	1.148	1.146	1.145	1.144	1.142	1.141	1.139

Table 1. Continued.

CODE	STAT	6	8	10	12	14	16	18
1201	DPTH	.178	.175	.172	.170	.170	.161	.154
	ENGY	.203	.198	.193	.188	.186	.176	.168
	DIFF	-.001	-.005	-.000	.001	.004	-.000	-.003
	ERGY	.204	.198	.193	.187	.182	.176	.171
1202	DPTH	.217	.220	.219	.218	.261	.212	.213
	ENGY	.241	.241	.236	.234	.272	.224	.223
	DIFF	-.004	-.002	-.003	-.005	.035	-.011	-.011
	ERGY	.245	.243	.241	.239	.237	.235	.233
1203	DPTH	.263	.264	.266	.266	.265	.263	.265
	ENGY	.284	.282	.282	.279	.276	.272	.271
	DIFF	-.001	-.000	.001	.001	.000	-.002	.000
	ERGY	.285	.283	.280	.278	.276	.273	.271
1204	DPTH	.243	.244	.246	.245	.244	.241	.243
	ENGY	.265	.267	.263	.259	.256	.251	.250
	DIFF	-.001	-.000	.002	.001	.000	-.002	.000
	ERGY	.266	.264	.261	.258	.256	.253	.250
1205	DPTH	.282	.283	.285	.286	.285	.283	.284
	ENGY	.302	.300	.300	.299	.295	.291	.289
	DIFF	-.001	-.000	.001	.002	.000	-.001	-.000
	ERGY	.303	.301	.299	.297	.294	.292	.290
1206	DPTH	.305	.308	.309	.313	.310	.310	.312
	ENGY	.324	.325	.323	.325	.319	.317	.316
	DIFF	-.002	.000	.000	.003	-.000	-.001	-.000
	ERGY	.326	.324	.323	.321	.320	.318	.317
1207	DPTH	.465	.467	.470	.472	.471	.470	.473
	ENGY	.481	.481	.482	.481	.478	.474	.475
	DIFF	-.001	-.000	.001	.002	.000	-.002	-.000
	ERGY	.483	.481	.480	.479	.478	.476	.475
1208	DPTH	.603	.605	.605	.610	.609	.608	.612
	ENGY	.619	.618	.616	.619	.615	.612	.613
	DIFF	-.000	.000	-.001	.003	.000	-.002	.000
	ERGY	.619	.618	.617	.616	.615	.614	.613
1209	DPTH	.274	.273	.277	.252	.259	.246	.231
	ENGY	.314	.316	.312	.298	.293	.281	.268
	DIFF	-.003	.002	.000	.000	.004	-.000	-.005
	ERGY	.322	.314	.306	.297	.289	.281	.273
1210	DPTH	.487	.488	.489	.498	.496	.485	.496
	ENGY	.520	.519	.519	.514	.510	.507	.505
	DIFF	-.001	.000	.001	.000	-.000	-.001	.000
	ERGY	.522	.519	.516	.513	.511	.508	.505
1211	DPTH	.510	.515	.516	.516	.515	.511	.515
	ENGY	.542	.544	.543	.540	.537	.531	.532
	DIFF	-.003	.001	.002	.002	.000	-.003	.000
	ERGY	.545	.543	.541	.538	.536	.534	.532
1212	DPTH	.467	.468	.468	.468	.466	.464	.465
	ENGY	.502	.501	.498	.496	.492	.487	.486
	DIFF	-.001	.000	.000	.001	-.000	-.001	.000
	ERGY	.503	.500	.497	.495	.492	.489	.486
1213	DPTH	.428	.429	.429	.429	.425	.421	.422
	ENGY	.467	.466	.463	.461	.455	.449	.447

Table 1. Continued.

	DIFF	-.002	.000	.001	.003	.000	-.002	-.000
	ERGY	.469	.465	.462	.458	.455	.451	.447
1214	DPTH	.473	.474	.476	.475	.470	.470	.472
	ENGY	.508	.506	.506	.502	.495	.493	.492
	DIFF	-.002	-.000	.002	.002	-.002	-.002	.000
	ERGY	.509	.506	.503	.500	.497	.494	.491
1215	DPTH	.482	.484	.484	.485	.479	.480	.481
	ENGY	.516	.515	.513	.511	.504	.502	.501
	DIFF	-.002	.000	.001	.003	-.002	-.000	.000
	ERGY	.518	.515	.512	.509	.506	.503	.500
1216	DPTH	.652	.655	.657	.658	.653	.655	.658
	ENGY	.677	.678	.677	.676	.668	.668	.668
	DIFF	-.002	.000	.002	.002	-.003	-.001	.001
	ERGY	.679	.677	.675	.673	.671	.669	.667
1217	DPTH	.808	.811	.814	.815	.810	.812	.816
	ENGY	.829	.830	.830	.830	.822	.821	.823
	DIFF	-.002	.000	.002	.004	-.003	-.002	.001
	ERGY	.831	.830	.828	.826	.825	.823	.822
1218	DPTH	.931	.936	.936	.939	.938	.937	.941
	ENGY	.951	.953	.951	.951	.948	.945	.946
	DIFF	-.002	.002	.000	.002	-.000	-.002	.000
	ERGY	.953	.952	.950	.949	.948	.947	.946
1219	DPTH	.447	.441	.439	.439	.423	.424	.417
	ENGY	.507	.500	.495	.493	.479	.477	.469
	DIFF	-.000	-.001	.000	.005	-.004	.000	-.000
	ERGY	.507	.501	.495	.489	.482	.476	.470
1220	DPTH	.729	.733	.737	.739	.739	.737	.739
	ENGY	.781	.778	.774	.774	.771	.757	.766
	DIFF	.000	.000	-.001	.000	.000	-.001	.000
	ERGY	.781	.778	.776	.773	.771	.768	.766
1221	DPTH	.695	.698	.697	.698	.694	.692	.694
	ENGY	.740	.741	.737	.736	.730	.726	.725
	DIFF	-.002	.001	.000	.002	-.000	-.002	.000
	ERGY	.743	.740	.737	.734	.731	.728	.725
1222	DPTH	.774	.776	.774	.778	.775	.773	.775
	ENGY	.813	.813	.809	.810	.805	.800	.800
	DIFF	-.001	.000	-.001	.003	.000	-.002	.000
	ERGY	.815	.812	.810	.807	.805	.802	.800
1223	DPTH	.720	.722	.723	.725	.720	.719	.720
	ENGY	.763	.763	.761	.761	.754	.750	.749
	DIFF	-.002	.000	.001	.003	-.000	-.002	-.000
	ERGY	.765	.763	.760	.757	.755	.752	.749
1224	DPTH	.816	.816	.818	.819	.817	.815	.817
	ENGY	.853	.851	.850	.849	.844	.840	.839
	DIFF	-.000	-.000	.001	.002	.000	-.002	.000
	ERGY	.854	.851	.849	.847	.844	.842	.839
1225	DPTH	.729	.730	.731	.731	.729	.727	.730
	ENGY	.772	.770	.769	.766	.762	.758	.758
	DIFF	-.001	.000	.001	.001	-.000	-.002	.000
	ERGY	.773	.770	.768	.765	.762	.760	.757

Table 1. Continued.

1226	DPTH	.756	.758	.760	.761	.758	.756	.759
	ENGY	.797	.796	.796	.794	.789	.785	.785
	DIFF	-.002	-.000	.002	.003	-.000	-.002	.000
	ERGY	.798	.796	.794	.792	.789	.787	.785
1227	DPTH	.992	.994	.996	.997	.995	.994	.996
	ENGY	1.022	1.021	1.021	1.019	1.015	1.012	1.011
	DIFF	-.002	-.000	.001	.002	-.000	-.002	-.000
	ERGY	1.023	1.021	1.019	1.017	1.015	1.013	1.011
1228	DPTH	1.185	1.189	1.188	1.193	1.190	1.190	1.193
	ENGY	1.210	1.211	1.208	1.211	1.205	1.203	1.204
	DIFF	-.001	.000	-.000	.003	-.000	-.002	.000
	ERGY	1.211	1.210	1.209	1.207	1.206	1.205	1.203
1229	DPTH	.601	.589	.574	.578	.559	.552	.534
	ENGY	.720	.710	.698	.698	.684	.678	.666
	DIFF	.000	-.000	-.004	.005	-.000	.002	-.002
	ERGY	.719	.710	.702	.693	.685	.677	.668
1230	DPTH	.828	.831	.826	.825	.817	.818	.817
	ENGY	.905	.905	.898	.896	.886	.884	.881
	DIFF	-.002	.002	.000	.002	-.003	-.000	.000
	ERGY	.907	.903	.898	.894	.889	.885	.880
1231	DPTH	.896	.898	.899	.896	.893	.892	.893
	ENGY	.964	.963	.962	.957	.952	.948	.947
	DIFF	-.002	.000	.002	.000	-.001	-.001	.000
	ERGY	.966	.962	.959	.956	.953	.949	.946
1232	DPTH	.968	.969	.968	.967	.963	.960	.960
	ENGY	1.028	1.027	1.023	1.020	1.014	1.009	1.007
	DIFF	-.002	.000	.001	.002	-.000	-.001	.000
	ERGY	1.030	1.026	1.022	1.018	1.014	1.010	1.006
1233	DPTH	.948	.946	.947	.946	.942	.939	.943
	ENGY	1.010	1.006	1.004	1.001	.995	.990	.991
	DIFF	-.000	-.000	.001	.001	-.001	-.003	.002
	ERGY	1.010	1.007	1.003	1.000	.996	.993	.989
1234	DPTH	.882	.882	.880	.880	.875	.875	.876
	ENGY	.952	.949	.945	.943	.936	.933	.932
	DIFF	-.000	.000	.000	.001	-.002	-.000	.001
	ERGY	.952	.948	.945	.941	.938	.934	.931
1235	DPTH	1.002	1.003	1.003	1.003	1.001	.998	.999
	ENGY	1.059	1.058	1.055	1.053	1.049	1.043	1.042
	DIFF	-.001	.000	.000	.002	.000	-.002	-.000
	ERGY	1.061	1.057	1.054	1.051	1.048	1.045	1.042
1236	DPTH	1.020	1.022	1.021	1.021	1.017	1.015	1.017
	ENGY	1.076	1.075	1.072	1.069	1.063	1.059	1.058
	DIFF	-.002	.000	.000	.002	-.000	-.002	.000
	ERGY	1.077	1.074	1.071	1.067	1.064	1.061	1.058
1237	DPTH	1.183	1.184	1.185	1.185	1.186	1.181	1.185
	ENGY	1.228	1.227	1.225	1.223	1.221	1.214	1.216
	DIFF	-.000	-.000	.000	.000	.002	-.003	.000
	ERGY	1.229	1.227	1.224	1.222	1.220	1.217	1.215
1238	DPTH	1.360	1.363	1.366	1.368	1.364	1.364	1.368
	ENGY	1.398	1.398	1.399	1.398	1.392	1.389	1.391
	DIFF	-.002	-.000	.002	.003	-.002	-.002	.000
	ERGY	1.400	1.398	1.397	1.395	1.393	1.392	1.390

Table 1. Continued.

CODE	STAT	6	8	10	12	14	16	18
1301	DPTH	.169	.163	.161	.162	.161	.154	.155
	ENGY	.204	.195	.190	.186	.182	.172	.169
	DIFF	.002	-.002	-.002	.001	.002	-.002	.000
	ERGY	.203	.197	.191	.185	.180	.174	.168
1302	DPTH	.220	.222	.225	.227	.226	.226	.229
	ENGY	.252	.250	.248	.246	.241	.237	.236
	DIFF	-.001	-.000	.001	.002	-.000	-.001	.000
	ERGY	.253	.250	.247	.244	.242	.239	.236
1303	DPTH	.258	.259	.263	.265	.266	.266	.270
	ENGY	.288	.285	.284	.282	.279	.275	.275
	DIFF	-.000	-.001	.000	.001	.000	-.002	.000
	ERGY	.288	.286	.283	.281	.279	.277	.275
1304	DPTH	.198	.199	.201	.201	.200	.198	.200
	ENGY	.232	.229	.226	.222	.217	.212	.209
	DIFF	-.001	-.000	.001	.001	.000	-.002	.000
	ERGY	.233	.229	.225	.221	.217	.213	.209
1305	DPTH	.315	.318	.323	.327	.327	.329	.334
	ENGY	.343	.342	.343	.343	.339	.336	.337
	DIFF	-.000	-.000	.001	.002	-.000	-.002	.000
	ERGY	.344	.343	.341	.340	.339	.338	.337
1306	DPTH	.473	.478	.482	.485	.487	.488	.493
	ENGY	.499	.500	.500	.499	.497	.494	.495
	DIFF	-.002	.000	.001	.001	.000	-.002	.000
	ERGY	.500	.499	.498	.497	.496	.495	.494
1307	DPTH	.390	.394	.399	.403	.403	.404	.410
	ENGY	.416	.416	.417	.417	.413	.410	.412
	DIFF	-.001	-.000	.002	.003	-.000	-.002	.000
	ERGY	.418	.417	.416	.415	.414	.413	.412
1308	DPTH	.263	.265	.263	.255	.251	.239	.231
	ENGY	.315	.313	.307	.297	.290	.277	.268
	DIFF	-.005	.000	.004	.002	.003	-.002	-.003
	ERGY	.320	.312	.304	.295	.287	.279	.270
1309	DPTH	.342	.345	.345	.349	.349	.348	.351
	ENGY	.387	.385	.381	.381	.377	.372	.371
	DIFF	-.000	.000	-.000	.002	.000	-.001	.000
	ERGY	.388	.385	.382	.379	.376	.374	.371
1310	DPTH	.367	.370	.371	.375	.375	.375	.380
	ENGY	.409	.408	.405	.404	.400	.396	.397
	DIFF	-.000	.000	-.000	.002	-.000	-.002	.000
	ERGY	.410	.407	.405	.403	.401	.398	.396
1311	DPTH	.300	.302	.303	.306	.309	.304	.303
	ENGY	.351	.349	.346	.344	.343	.334	.330
	DIFF	-.002	-.000	-.000	.002	.004	-.001	-.002
	ERGY	.353	.349	.346	.342	.339	.335	.332
1312	DPTH	.422	.425	.428	.433	.433	.434	.439
	ENGY	.460	.459	.457	.458	.454	.451	.452
	DIFF	-.000	-.000	.000	.002	-.000	-.002	.000
	ERGY	.460	.459	.457	.456	.454	.453	.451

Table 1. Continued.

1313	DPTH	.579	.583	.586	.592	.593	.594	.600
	ENGY	.610	.610	.609	.611	.608	.605	.607
	DIFF	-.000	-.000	-.000	.002	.000	-.002	.000
	ERGY	.611	.610	.609	.609	.608	.607	.606
1314	DPTH	.300	.305	.303	.309	.306	.304	.304
	ENGY	.351	.352	.346	.347	.340	.334	.330
	DIFF	-.003	.002	-.000	.004	.000	-.001	-.001
	ERGY	.354	.350	.347	.343	.339	.336	.332
1315	DPTH	.907	.912	.916	.922	.923	.923	.929
	ENGY	.934	.935	.935	.937	.934	.930	.932
	DIFF	-.002	-.000	.000	.003	.000	-.003	-.000
	ERGY	.936	.935	.934	.934	.933	.932	.932
1316	DPTH	.427	.429	.423	.427	.422	.419	.417
	ENGY	.501	.498	.490	.499	.481	.475	.469
	DIFF	-.001	.001	-.002	.003	.000	-.000	-.000
	ERGY	.502	.497	.491	.486	.481	.475	.470
1317	DPTH	.552	.553	.554	.556	.555	.555	.557
	ENGY	.607	.604	.601	.599	.594	.590	.588
	DIFF	-.000	-.000	.000	.001	-.000	-.000	.000
	ERGY	.608	.604	.601	.597	.594	.591	.587
1318	DPTH	.541	.543	.544	.545	.543	.543	.548
	ENGY	.597	.595	.592	.589	.583	.579	.580
	DIFF	-.000	.000	.000	.001	-.001	-.002	.002
	ERGY	.598	.595	.591	.588	.585	.581	.578
1319	DPTH	.532	.534	.534	.537	.537	.536	.541
	ENGY	.590	.587	.583	.582	.578	.573	.573
	DIFF	-.000	.000	-.000	.000	-.000	-.002	.001
	ERGY	.590	.587	.584	.581	.578	.575	.572
1320	DPTH	.685	.688	.689	.694	.693	.693	.699
	ENGY	.729	.728	.725	.726	.721	.717	.718
	DIFF	-.000	.000	-.000	.002	-.000	-.002	.001
	ERGY	.730	.728	.726	.723	.721	.719	.717
1321	DPTH	.856	.861	.863	.868	.869	.869	.876
	ENGY	.893	.894	.892	.893	.890	.886	.888
	DIFF	-.001	.000	-.000	.002	.000	-.003	.001
	ERGY	.894	.893	.892	.891	.889	.888	.887
1322	DPTH	.560	.560	.581	.571	.561	.555	.540
	ENGY	.704	.700	.709	.699	.689	.681	.669
	DIFF	-.006	-.004	.010	.006	.002	-.000	-.006
	ERGY	.710	.705	.699	.693	.687	.681	.676
1323	DPTH	.864	.865	.866	.869	.869	.867	.869
	ENGY	.944	.941	.938	.937	.933	.927	.925
	DIFF	-.000	-.000	-.000	.002	.001	-.001	-.000
	ERGY	.945	.942	.938	.935	.932	.928	.925
1324	DPTH	.850	.853	.849	.851	.854	.853	.856
	ENGY	.932	.931	.923	.921	.920	.915	.913
	DIFF	.000	.002	-.002	-.001	.000	-.000	.001
	ERGY	.932	.929	.926	.922	.919	.916	.912

Table 1. Continued.

1325	DPTH	.882	.884	.883	.884	.884	.883	.886
	ENGY	.960	.958	.953	.950	.946	.941	.940
	DIFF	-.000	.000	-.000	.000	-.000	-.001	.000
	ERGY	.961	.957	.953	.950	.946	.942	.939
1326	DPTH	1.017	1.015	1.018	1.022	1.023	1.022	1.027
	ENGY	1.082	1.076	1.075	1.074	1.071	1.066	1.067
	DIFF	.002	-.002	-.000	.001	.000	-.002	.001
	ERGY	1.080	1.078	1.075	1.073	1.071	1.068	1.066
1327	DPTH	1.185	1.191	1.193	1.194	1.194	1.194	1.201
	ENGY	1.239	1.241	1.239	1.236	1.232	1.228	1.230
	DIFF	-.002	.002	.002	.000	-.001	-.003	.002
	ERGY	1.241	1.239	1.237	1.235	1.233	1.230	1.228

Table 1. Continued.

CODE	STAT	6	8	10	12	14	16	18
1401	DPTH	.151	.157	.150	.150	.152	.148	.147
	ENGY	.204	.202	.190	.184	.179	.169	.162
	DIFF	-.002	.004	-.001	-.000	.002	-.000	-.000
	ERGY	.206	.199	.191	.184	.177	.170	.163
1402	DPTH	.184	.186	.190	.193	.195	.197	.201
	ENGY	.234	.229	.226	.223	.218	.213	.211
	DIFF	.000	-.000	.000	.000	-.000	-.000	.000
	ERGY	.234	.230	.226	.222	.218	.214	.210
1403	DPTH	.195	.199	.201	.210	.210	.211	.218
	ENGY	.244	.241	.236	.238	.232	.226	.226
	DIFF	-.000	-.000	-.002	.003	.000	-.002	.000
	ERGY	.244	.241	.238	.235	.232	.229	.225
1404	DPTH	.207	.212	.214	.219	.223	.224	.231
	ENGY	.255	.253	.248	.246	.244	.238	.238
	DIFF	-.000	.000	-.000	.000	.000	-.002	.001
	ERGY	.255	.252	.249	.246	.243	.240	.237
1405	DPTH	.185	.195	.194	.195	.199	.199	.204
	ENGY	.235	.237	.230	.224	.222	.215	.213
	DIFF	-.003	.004	.000	-.000	.000	-.002	.000
	ERGY	.238	.234	.229	.225	.221	.217	.213
1406	DPTH	.493	.500	.505	.513	.517	.521	.530
	ENGY	.533	.534	.532	.534	.531	.529	.531
	DIFF	-.000	.000	-.000	.002	-.000	-.002	.001
	ERGY	.534	.533	.533	.532	.531	.531	.530
1407	DPTH	.716	.724	.729	.737	.741	.744	.754
	ENGY	.755	.757	.755	.757	.755	.751	.755
	DIFF	-.001	.000	-.000	.002	.000	-.003	.001
	ERGY	.756	.756	.755	.755	.754	.754	.753
1408	DPTH	.248	.243	.238	.242	.246	.232	.229
	ENGY	.318	.308	.298	.294	.291	.275	.266
	DIFF	.000	-.001	-.003	.002	.006	-.002	-.002
	ERGY	.318	.309	.301	.293	.285	.277	.268
1409	DPTH	.306	.314	.319	.324	.328	.325	.331
	ENGY	.368	.368	.366	.364	.361	.352	.351
	DIFF	-.003	.000	.002	.003	.003	-.003	-.001
	ERGY	.371	.368	.364	.361	.358	.355	.352
1410	DPTH	.323	.330	.327	.332	.340	.343	.348
	ENGY	.382	.382	.373	.371	.372	.368	.366
	DIFF	.000	.003	-.003	-.002	.001	.000	.000
	ERGY	.382	.379	.376	.373	.371	.368	.365
1411	DPTH	.292	.296	.295	.298	.298	.299	.300
	ENGY	.356	.353	.346	.342	.335	.330	.324
	DIFF	-.001	.001	-.000	.000	-.000	-.000	-.000
	ERGY	.357	.352	.346	.341	.335	.330	.324
1412	DPTH	.281	.285	.291	.292	.293	.291	.293
	ENGY	.347	.344	.342	.337	.331	.323	.318
	DIFF	-.002	-.000	.003	.002	.001	-.002	-.001
	ERGY	.349	.344	.340	.335	.330	.325	.320

Table 1. Continued.

1413	DPTH	.577	.585	.590	.598	.602	.604	.614
	ENGY	.622	.623	.622	.623	.621	.616	.620
	DIFF	-.001	.000	.000	.002	.000	-.003	.001
	ERGY	.623	.623	.622	.621	.620	.620	.619
1414	DPTH	.854	.861	.866	.874	.878	.881	.889
	ENGY	.895	.895	.894	.896	.894	.890	.892
	DIFF	-.001	.000	-.000	.002	.000	-.002	.000
	ERGY	.896	.895	.895	.894	.893	.892	.891
1415	DPTH	.388	.384	.383	.376	.376	.368	.360
	ENGY	.492	.483	.476	.465	.458	.447	.436
	DIFF	-.000	-.000	.001	-.000	.002	.000	-.002
	ERGY	.493	.483	.474	.465	.456	.447	.438
1416	DPTH	.486	.491	.495	.499	.499	.501	.507
	ENGY	.568	.565	.562	.559	.553	.548	.547
	DIFF	-.001	.000	.001	.002	-.000	-.002	.000
	ERGY	.569	.565	.561	.557	.554	.550	.546
1417	DPTH	.478	.480	.479	.484	.487	.488	.492
	ENGY	.561	.556	.549	.547	.543	.537	.534
	DIFF	.000	.000	-.002	-.000	.000	-.000	.000
	ERGY	.560	.556	.551	.547	.542	.538	.533
1418	DPTH	.502	.508	.510	.517	.518	.521	.526
	ENGY	.581	.580	.575	.574	.569	.565	.563
	DIFF	-.000	.000	-.000	.002	-.000	-.000	.000
	ERGY	.582	.579	.576	.572	.569	.566	.563
1419	DPTH	.472	.473	.474	.476	.483	.481	.486
	ENGY	.556	.551	.545	.540	.540	.532	.529
	DIFF	.001	-.000	-.001	-.002	.002	-.001	.000
	ERGY	.555	.551	.546	.542	.537	.533	.528
1420	DPTH	.760	.767	.774	.779	.785	.786	.794
	ENGY	.816	.816	.817	.815	.814	.809	.810
	DIFF	-.002	-.000	.001	.001	.002	-.003	-.000
	ERGY	.813	.816	.815	.814	.813	.811	.810
1421	DPTH	.973	.980	.984	.993	.996	.999	1.007
	ENGY	1.022	1.023	1.020	1.023	1.019	1.016	1.017
	DIFF	-.000	.000	-.000	.003	.000	-.002	.000
	ERGY	1.023	1.022	1.021	1.020	1.019	1.018	1.017
1422	DPTH	.562	.558	.543	.536	.532	.524	.522
	ENGY	.720	.711	.696	.686	.678	.668	.660
	DIFF	.000	.002	-.002	-.002	-.000	-.000	.002
	ERGY	.719	.709	.699	.689	.678	.668	.658
1423	DPTH	.669	.679	.673	.678	.679	.684	.689
	ENGY	.780	.782	.771	.768	.763	.760	.758
	DIFF	-.001	.005	-.002	-.000	-.002	-.000	.002
	ERGY	.782	.777	.773	.769	.765	.760	.756
1424	DPTH	.677	.691	.679	.690	.585	.682	.692
	ENGY	.787	.783	.775	.778	.767	.759	.760
	DIFF	-.000	.000	-.002	.005	-.000	-.004	.002
	ERGY	.787	.783	.778	.773	.768	.763	.758
1425	DPTH	.686	.690	.686	.693	.701	.697	.701
	ENGY	.794	.791	.781	.780	.780	.771	.767

Table 1. Continued.

	DIFF	.000	.001	-.004	-.000	.004	-.001	-.000
	ERGY	.793	.789	.785	.781	.776	.772	.768
1426	DPTH	.708	.708	.708	.715	.714	.720	.726
	ENGY	.812	.805	.799	.798	.791	.789	.788
	DIFF	.002	-.000	-.003	.000	-.003	-.000	.002
	ERGY	.809	.805	.801	.797	.793	.790	.786
1427	DPTH	.902	.909	.915	.921	.924	.925	.930
	ENGY	.981	.981	.980	.979	.975	.970	.968
	DIFF	-.002	-.000	.001	.003	.001	-.002	-.001
	ERGY	.983	.981	.978	.976	.974	.971	.969
1428	DPTH	1.124	1.132	1.134	1.137	1.144	1.150	1.156
	ENGY	1.188	1.189	1.185	1.181	1.182	1.181	1.180
	DIFF	-.000	.002	-.000	-.002	-.000	.000	.001
	ERGY	1.189	1.187	1.185	1.184	1.182	1.181	1.179

CODE	STAT	6	8	10	12	14	16	18
1501	DPTH	.137	.141	.138	.137	.136	.137	.142
	ENGY	.214	.207	.195	.184	.174	.164	.158
	DIFF	-.000	.002	-.000	-.000	-.002	-.001	.002
	ERGY	.215	.205	.195	.185	.175	.166	.156
1502	DPTH	.152	.157	.162	.165	.171	.170	.177
	ENGY	.229	.223	.217	.209	.204	.194	.189
	DIFF	-.000	-.000	.000	.000	.002	-.002	.000
	ERGY	.230	.223	.216	.209	.203	.196	.189
1503	DPTH	.185	.198	.205	.214	.221	.226	.237
	ENGY	.256	.258	.254	.253	.249	.244	.244
	DIFF	-.002	.002	.000	.001	.000	-.002	.000
	ERGY	.259	.256	.254	.251	.249	.246	.243
1504	DPTH	.207	.215	.226	.236	.242	.247	.258
	ENGY	.276	.273	.274	.273	.269	.263	.264
	DIFF	-.000	-.001	.001	.003	.000	-.002	.000
	ERGY	.277	.275	.273	.270	.268	.266	.264
1505	DPTH	.383	.397	.403	.416	.423	.429	.441
	ENGY	.446	.449	.445	.448	.445	.441	.443
	DIFF	-.002	.002	-.000	.003	.000	-.003	.000
	ERGY	.448	.447	.446	.445	.445	.444	.443
1506	DPTH	.548	.558	.569	.580	.588	.596	.605
	ENGY	.609	.609	.610	.611	.609	.607	.606
	DIFF	-.001	-.000	.000	.002	.000	-.000	-.001
	ERGY	.611	.610	.609	.609	.608	.608	.607
1507	DPTH	.706	.717	.728	.739	.745	.753	.764
	ENGY	.767	.768	.769	.770	.766	.764	.765
	DIFF	-.002	-.000	.001	.003	-.000	-.002	-.000
	ERGY	.769	.768	.767	.767	.766	.765	.765
1508	DPTH	.168	.174	.180	.190	.194	.201	.210
	ENGY	.242	.237	.232	.231	.224	.221	.219
	DIFF	.000	-.000	-.001	.001	-.001	-.000	.001
	ERGY	.241	.237	.233	.229	.225	.222	.218
1509	DPTH	.224	.232	.226	.229	.228	.220	.215
	ENGY	.323	.318	.304	.296	.285	.270	.257
	DIFF	-.004	.002	-.000	.003	.003	-.000	-.003
	ERGY	.327	.316	.305	.293	.282	.271	.260
1510	DPTH	.243	.252	.259	.264	.272	.271	.284
	ENGY	.330	.327	.323	.317	.313	.303	.304
	DIFF	-.001	.000	.001	.000	.002	-.004	.002
	ERGY	.331	.325	.321	.317	.312	.307	.302
1511	DPTH	.454	.465	.474	.486	.494	.501	.514
	ENGY	.522	.522	.521	.523	.520	.517	.520
	DIFF	-.000	.000	-.000	.002	.000	-.002	.000
	ERGY	.522	.522	.521	.521	.520	.520	.519
1512	DPTH	.602	.614	.623	.634	.644	.650	.664
	ENGY	.666	.668	.667	.668	.668	.664	.668
	DIFF	-.001	.000	-.000	.000	.001	-.003	.001
	ERGY	.667	.667	.667	.667	.667	.667	.666

Table 1. Continued.

1513	DPTH	.760	.771	.780	.793	.802	.808	.821
	ENGY	.823	.824	.823	.826	.824	.820	.823
	DIFF	-.000	.000	-.000	.002	.001	-.003	.000
	ERGY	.824	.823	.823	.823	.823	.823	.823
1514	DPTH	.247	.252	.258	.269	.273	.275	.286
	ENGY	.333	.327	.322	.321	.314	.306	.305
	DIFF	.000	-.000	-.001	.003	.000	-.003	.001
	ERGY	.332	.328	.323	.318	.314	.309	.304
1515	DPTH	.264	.270	.283	.287	.294	.301	.310
	ENGY	.347	.342	.343	.336	.332	.328	.326
	DIFF	-.000	-.002	.003	-.000	-.000	-.000	.000
	ERGY	.347	.343	.340	.336	.333	.329	.326
1516	DPTH	.351	.359	.360	.348	.355	.353	.344
	ENGY	.496	.486	.476	.459	.453	.442	.427
	DIFF	-.000	.000	.002	-.004	.002	.002	-.002
	ERGY	.497	.486	.474	.463	.451	.440	.429
1517	DPTH	.665	.674	.683	.683	.702	.710	.722
	ENGY	.749	.747	.745	.735	.743	.741	.742
	DIFF	.002	.001	.000	-.008	.001	-.000	.003
	ERGY	.747	.746	.744	.743	.742	.741	.740
1518	DPTH	.511	.517	.528	.539	.546	.551	.563
	ENGY	.611	.606	.606	.605	.601	.595	.596
	DIFF	.000	-.002	.000	.002	.000	-.002	.000
	ERGY	.611	.608	.605	.603	.600	.598	.595
1519	DPTH	.987	.992	1.002	1.013	1.020	1.026	1.038
	ENGY	1.058	1.053	1.052	1.053	1.050	1.046	1.048
	DIFF	.001	-.002	-.000	.002	.000	-.002	.001
	ERGY	1.056	1.055	1.053	1.051	1.050	1.048	1.046
1520	DPTH	1.007	1.018	1.027	1.038	1.045	1.052	1.065
	ENGY	1.077	1.078	1.077	1.078	1.075	1.071	1.074
	DIFF	-.001	.000	.000	.002	-.000	-.003	.001
	ERGY	1.078	1.078	1.077	1.076	1.075	1.074	1.073
1521	DPTH	.417	.418	.423	.432	.440	.442	.448
	ENGY	.537	.528	.522	.518	.514	.506	.500
	DIFF	.002	-.002	-.002	.000	.002	-.000	-.000
	ERGY	.535	.529	.524	.518	.512	.506	.500
1522	DPTH	.409	.409	.415	.423	.425	.428	.437
	ENGY	.532	.522	.516	.512	.503	.495	.492
	DIFF	.002	-.002	-.000	.001	-.000	-.002	.002
	ERGY	.530	.523	.517	.510	.503	.497	.490
1523	DPTH	.520	.540	.529	.512	.508	.494	.500
	ENGY	.719	.719	.704	.686	.674	.659	.651
	DIFF	-.006	.006	.004	-.002	-.000	-.003	.002
	ERGY	.726	.713	.700	.687	.675	.662	.649
1524	DPTH	.575	.584	.586	.592	.596	.604	.607
	ENGY	.754	.749	.740	.734	.726	.722	.714
	DIFF	-.000	.001	-.000	-.000	-.000	.001	-.000
	ERGY	.754	.749	.741	.734	.727	.721	.714
1525	DPTH	.609	.610	.614	.624	.632	.637	.641
	ENGY	.775	.765	.758	.755	.750	.744	.737

Table 1. Continued.

	DIFF	.002	-.001	-.003	-.000	.001	.000	-.000
	ERGY	.773	.767	.761	.755	.749	.743	.737
1526	DPTH	.643	.642	.647	.661	.677	.680	.681
	ENGY	.798	.797	.781	.781	.783	.775	.766
	DIFF	.004	-.003	-.005	-.000	.005	.002	-.003
	ERGY	.794	.790	.786	.781	.777	.773	.769
1527	DPTH	.815	.822	.830	.837	.845	.860	.861
	ENGY	.934	.930	.927	.923	.920	.923	.914
	DIFF	.000	-.000	-.000	-.001	-.002	.004	-.002
	ERGY	.933	.930	.927	.924	.922	.919	.916
1528	DPTH	.959	.975	.981	.991	.999	1.003	1.018
	ENGY	1.062	1.066	1.062	1.061	1.058	1.052	1.056
	DIFF	-.003	.003	.000	.001	.000	-.004	.002
	ERGY	1.065	1.063	1.061	1.060	1.058	1.056	1.054

NOMENCLATURE

Symbol	Definition
Q	discharge, cfs
6.0	station or point of measurement (in feet) in a downstream direction, includes 8.0, 10.0 cfs
YN	normal flow depth, y_n
Y1	flow depth at station 6.0 corrected by 0.03 ', y
Y4	flow depth at station 18.0 corrected by 0.03', y_4
Y1-YN	$y_1 - y_n$
Y1/YN	y_1 / y_n
EN	energy for normal flow depth, $y_n + v^2_n/2g$
E1	energy at station 6.0, E_1, $(y_1 + v^2_1/2g)$
E4	energy at station 18.0, E_4, $(y_4 + v^2_4/2g)$
E1-E4	head (energy) loss, $E_1 - E_4$
E4/E1	E_4/E_1, E_r, ratio of energys
1-E15	computation of, $(1 - E_r^{1.5})$
FN	Froude number computed at normal flow depth, F
F1	Froude number computed at station 6.0
FB	Froude number computed at the minimum flow depth

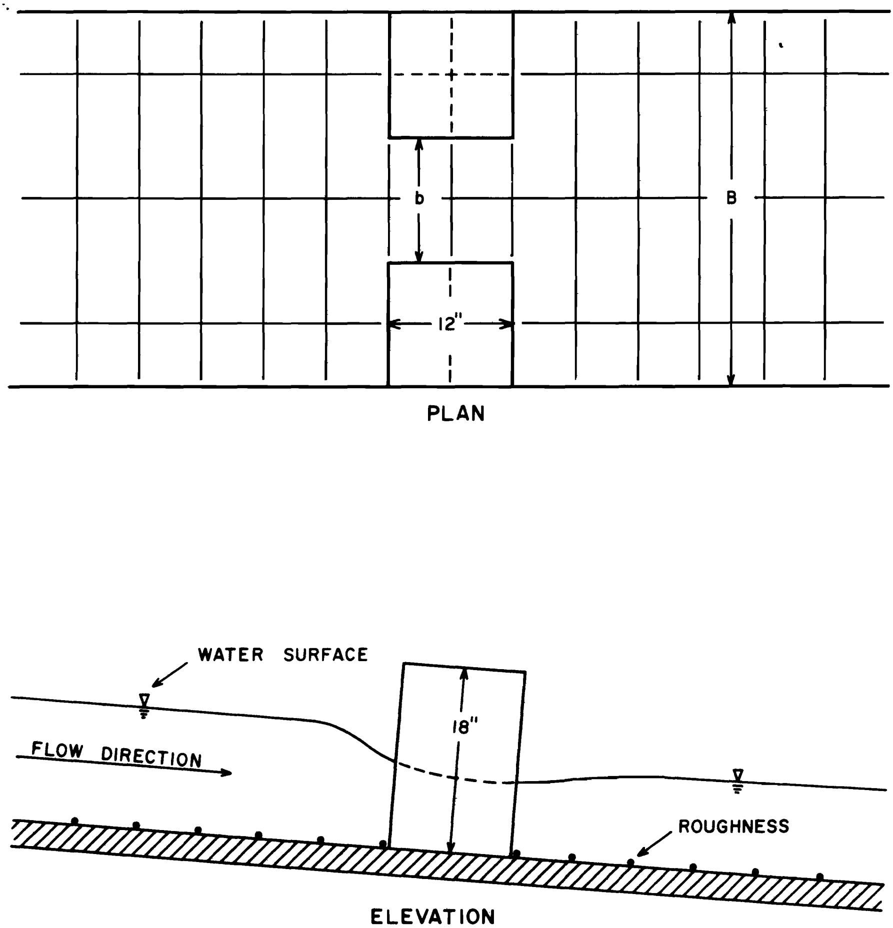


Figure 43. Definition sketch for vertical board constriction with bar roughness shown in tilting flume.

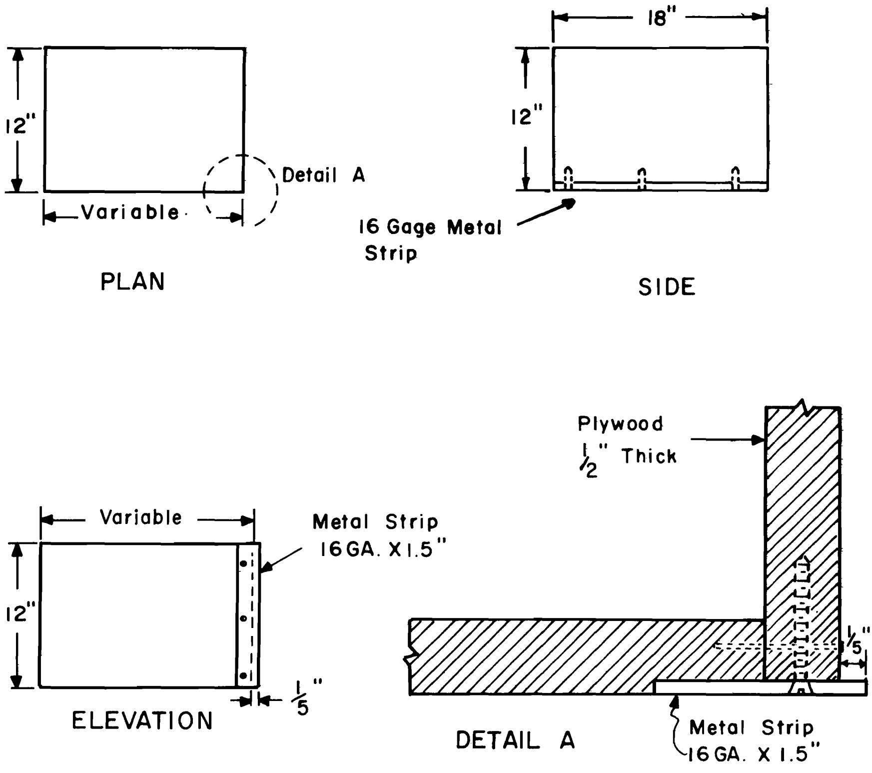


Figure 44. Definition sketch for vertical board constriction.

Table 2. Hydraulic data for tilting flume with vertical board constriction and with slope varying from 0.0000 to 0.0050.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
21 1	.480	.403	.403	.402	.386	.327	.176	.246	.182	.177	.186	.176	.191	.199
21 2	.480	.404	.404	.401	.386	.325	.181	.260	.202	.192	.206	.182	.212	.218
21 3	.480	.407	.407	.465	.388	.329	.179	.279	.207	.210	.237	.207	.238	.237
21 4	.480	.411	.411	.410	.391	.331	.217	.288	.271	.267	.269	.263	.281	.288
21 5	.480	.720	.720	.719	.707	.688	.681	.684	.689	.685	.688	.687	.694	.696
21 6	.480	1.018	1.019	1.017	1.008	1.000	.993	.996	1.000	.996	.996	.996	1.002	1.004
21 7	1.160	.716	.718	.715	.694	.623	.360	.256	.258	.222	.165	.160	.204	.252
21 8	1.160	.717	.718	.718	.693	.621	.352	.255	.266	.230	.182	.192	.217	.272
21 9	1.160	.717	.718	.717	.693	.623	.355	.255	.270	.251	.195	.219	.237	.286
2110	1.160	.719	.720	.719	.698	.632	.357	.313	.350	.331	.324	.275	.319	.345
2111	1.160	.959	.961	.959	.943	.893	.847	.863	.862	.863	.867	.870	.879	.881
2112	1.160	1.266	1.268	1.266	1.253	1.219	1.197	1.222	1.214	1.213	1.217	1.217	1.223	1.226
2113	1.670	.898	.898	.897	.872	.800	.487	.318	.268	.240	.196	.146	.268	.306
2114	1.670	.897	.899	.896	.872	.797	.483	.315	.270	.243	.207	.152	.264	.296
2115	1.670	.898	.902	.897	.872	.800	.484	.323	.274	.261	.229	.240	.294	.319
2116	1.670	.901	.901	.898	.876	.803	.500	.337	.311	.354	.322	.344	.387	.381
2117	1.670	1.186	1.186	1.185	1.165	1.103	1.017	1.068	1.069	1.062	1.065	1.064	1.073	1.078
2118	1.670	1.389	1.392	1.391	1.374	1.316	1.265	1.293	1.304	1.306	1.300	1.300	1.310	1.315
2119	2.390	1.126	1.127	1.122	1.101	1.023	.676	.427	.304	.247	.204	.182	.454	.459
2120	2.390	1.125	1.124	1.124	1.096	1.029	.679	.419	.309	.257	.210	.252	.463	.467
2121	2.390	1.125	1.126	1.122	1.100	1.026	.669	.421	.306	.155	.215	.227	.452	.486
2122	2.390	1.133	1.133	1.132	1.103	1.038	.683	.456	.314	.380	.483	.496	.486	.511
2123	2.390	1.262	1.264	1.261	1.238	1.173	.880	.953	1.044	1.018	1.015	1.027	1.021	1.029
2124	2.390	1.389	1.390	1.388	1.362	1.309	1.109	1.200	1.228	1.219	1.219	1.215	1.215	1.227

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
21 1	.480	.000	.373	.169	.000	.000	.000	.376	.183	.193	.486	.661	.000	.123	2.046
21 2	.480	.000	.374	.188	.000	.000	.000	.377	.199	.178	.528	.616	.000	.122	1.945
21 3	.480	.000	.377	.207	.000	.000	.000	.380	.216	.164	.569	.571	.000	.121	1.985
21 4	.480	.000	.381	.258	.000	.000	.000	.384	.264	.120	.688	.430	.000	.119	1.412
21 5	.480	.000	.690	.666	.000	.000	.000	.691	.667	.024	.965	.052	.000	.049	.217
21 6	.480	.000	.988	.974	.000	.000	.000	.988	.974	.014	.986	.021	.000	.029	.121
21 7	1.160	.000	.686	.222	.000	.000	.000	.691	.268	.422	.389	.758	.000	.119	5.886
21 8	1.160	.000	.687	.242	.000	.000	.000	.692	.281	.411	.406	.741	.000	.119	4.655
21 9	1.160	.000	.687	.256	.000	.000	.000	.692	.291	.401	.421	.727	.000	.119	4.116
2110	1.160	.000	.689	.315	.000	.000	.000	.694	.338	.356	.487	.660	.000	.118	2.275
2111	1.160	.000	.929	.851	.000	.000	.000	.932	.854	.077	.917	.122	.000	.076	.374
2112	1.160	.000	1.236	1.196	.000	.000	.000	1.237	1.198	.040	.968	.048	.000	.049	.219
2113	1.670	.000	.868	.276	.000	.000	.000	.874	.338	.536	.387	.759	.000	.121	10.053
2114	1.670	.000	.867	.266	.000	.000	.000	.873	.333	.540	.381	.764	.000	.121	9.320
2115	1.670	.000	.868	.289	.000	.000	.000	.874	.346	.529	.396	.751	.000	.121	4.474
2116	1.670	.000	.871	.351	.000	.000	.000	.877	.390	.488	.444	.704	.000	.120	2.666
2117	1.670	.000	1.156	1.048	.000	.000	.000	1.160	1.052	.107	.908	.135	.000	.078	.405
2118	1.670	.000	1.359	1.285	.000	.000	.000	1.362	1.288	.074	.946	.080	.000	.062	.289
2119	2.390	.000	1.096	.429	.000	.000	.000	1.104	.482	.622	.436	.712	.000	.122	9.591
2120	2.390	.000	1.095	.437	.000	.000	.000	1.103	.488	.615	.442	.706	.000	.122	7.443
2121	2.390	.000	1.095	.456	.000	.000	.000	1.103	.503	.600	.456	.692	.000	.122	12.861
2122	2.390	.000	1.103	.481	.000	.000	.000	1.111	.523	.588	.471	.677	.000	.120	3.756
2123	2.390	.000	1.232	.999	.000	.000	.000	1.238	1.009	.230	.815	.265	.000	.102	.725
2124	2.390	.000	1.359	1.197	.000	.000	.000	1.364	1.204	.160	.882	.171	.000	.088	.507

Table 2. Continued.

CODE	0	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
22 1	.500	.401	.404	.405	.388	.328	.179	.129	.171	.144	.166	.173	.179	.197
22 2	.500	.403	.405	.406	.389	.329	.187	.280	.216	.224	.238	.219	.240	.450
22 3	.500	.415	.419	.420	.404	.346	.279	.306	.309	.309	.305	.309	.314	.324
22 4	.500	.465	.469	.469	.456	.407	.393	.389	.391	.391	.096	.400	.405	.412
22 5	.500	.744	.748	.749	.742	.722	.720	.722	.725	.723	.724	.724	.731	.737
22 6	.500	1.012	1.015	1.017	1.010	1.000	.997	1.000	1.000	1.001	1.000	1.000	1.008	1.012
22 7	1.150	.705	.706	.707	.687	.619	.350	.252	.256	.208	.146	.137	.208	.264
22 8	1.150	.705	.786	.708	.688	.619	.350	.259	.282	.262	.233	.240	.259	.297
22 9	1.150	.707	.710	.711	.688	.626	.353	.276	.397	.359	.340	.289	.336	.366
2210	1.150	.717	.720	.721	.702	.635	.379	.489	.826	.469	.474	.511	.490	.517
2211	1.150	.969	.973	.975	.960	.911	.864	.882	.895	.888	.897	.898	.903	.908
2212	1.150	1.236	1.240	1.240	1.231	1.201	1.176	1.203	1.194	1.194	1.197	1.195	1.204	1.208
2213	2.350	1.101	1.106	1.106	1.081	1.011	.655	.414	.289	.098	.106	.172	.419	.448
2214	2.350	1.102	1.106	1.107	1.083	1.002	.661	.290	.307	.167	.173	.336	.445	.463
2215	2.350	1.107	1.110	1.110	1.083	1.011	.667	.431	.315	.309	.307	.313	.450	.465
2216	2.350	1.114	1.118	1.117	1.092	1.025	.680	.452	.403	.445	.565	.555	.510	.553
2217	2.350	1.221	1.224	1.225	1.200	1.138	.843	.896	1.009	.979	.965	.977	.973	.985
2218	2.350	1.379	1.385	1.383	1.366	1.302	1.123	1.209	1.238	1.225	1.231	1.229	1.236	1.247

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
22 1	.500	.181	.371	.167	.190	2.050	.216	.388	.182	.206	.469	.679	.379	.129	3.817
22 2	.500	.181	.373	.420	.192	2.061	.191	.390	.422	-.032	1.082	-.125	.379	.128	1.912
22 3	.500	.181	.385	.294	.204	2.127	.188	.402	.299	.103	.743	.359	.379	.122	.957
22 4	.500	.181	.435	.382	.254	2.403	.329	.452	.385	.067	.852	.213	.379	.102	7.013
22 5	.500	.181	.714	.707	.533	3.945	.207	.729	.708	.021	.971	.044	.379	.048	.207
22 6	.500	.181	.982	.982	.801	5.425	.230	.997	.982	.014	.986	.022	.379	.030	.125
22 7	1.150	.323	.675	.234	.352	2.090	.509	.694	.275	.419	.396	.751	.366	.121	7.814
22 8	1.150	.323	.675	.267	.352	2.090	.343	.694	.299	.396	.430	.718	.366	.121	2.990
22 9	1.150	.323	.677	.336	.354	2.096	.335	.696	.356	.340	.511	.635	.366	.120	2.242
2210	1.150	.323	.687	.487	.364	2.127	.330	.706	.496	.210	.703	.410	.366	.118	1.327
2211	1.150	.323	.939	.878	.616	2.907	.336	.956	.881	.075	.922	.115	.366	.074	.359
2212	1.150	.323	1.206	1.178	.883	3.734	.346	1.222	1.180	.042	.965	.052	.366	.051	.223
2213	2.350	.540	1.071	.418	.531	1.983	7.227	1.094	.472	.622	.431	.717	.346	.124	31.518
2214	2.350	.540	1.072	.433	.532	1.985	.958	1.095	.483	.611	.441	.707	.346	.124	11.022
2215	2.350	.540	1.077	.435	.537	1.994	.571	1.100	.485	.615	.441	.707	.346	.123	3.834
2216	2.350	.540	1.084	.523	.544	2.007	.553	1.106	.557	.549	.504	.642	.346	.122	2.453
2217	2.350	.540	1.191	.955	.651	2.206	.546	1.212	.965	.247	.796	.289	.346	.106	.762
2218	2.350	.540	1.349	1.217	.809	2.498	.549	1.369	1.223	.145	.894	.155	.346	.088	.489

Table 2. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
23 1	.530	.418	.422	.424	.411	.248	.189	.119	.173	.126	.157	.175	.172	.190
23 2	.530	.418	.424	.426	.409	.349	.192	.275	.231	.212	.249	.213	.240	.257
23 3	.530	.424	.429	.431	.416	.357	.257	.303	.305	.301	.307	.302	.315	.329
23 4	.530	.474	.479	.482	.469	.416	.390	.414	.404	.406	.412	.410	.419	.423
23 5	.530	.724	.730	.733	.726	.704	.693	.702	.708	.707	.706	.708	.717	.722
23 6	.530	.996	1.001	1.005	1.001	.990	.984	.988	.991	.990	.991	.993	1.000	1.005
23 7	1.120	.683	.690	.692	.673	.603	.336	.244	.283	.204	.137	.119	.209	.240
23 8	1.120	.684	.690	.694	.676	.604	.343	.255	.271	.252	.186	.223	.254	.200
23 9	1.120	.687	.691	.694	.676	.607	.348	.272	.382	.347	.309	.311	.321	.352
2310	1.120	.694	.697	.700	.684	.611	.363	.406	.534	.428	.416	.479	.454	.472
2311	1.120	.955	.961	.962	.954	.902	.849	.876	.882	.890	.894	.894	.903	.908
2312	1.120	1.237	1.243	1.246	1.238	1.207	1.189	1.211	1.207	1.204	1.206	1.200	1.218	1.224
2313	2.340	1.097	1.104	1.103	1.082	1.006	.661	.414	.302	.240	.201	.161	.387	.446
2314	2.340	1.099	1.104	1.105	1.084	1.012	.651	.416	.307	.247	.203	.329	.452	.475
2315	2.340	1.101	1.106	1.108	1.085	1.014	.663	.430	.333	.284	.266	.288	.463	.471
2316	2.340	1.108	1.113	1.117	1.099	1.027	.681	.462	.409	.400	.573	.544	.535	.588
2317	2.340	1.258	1.264	1.267	1.268	1.183	.910	1.007	1.093	1.062	1.063	1.064	1.067	1.078
2318	2.340	1.397	1.404	1.406	1.390	1.324	1.169	1.232	1.263	1.266	1.264	1.270	1.274	1.278

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
23 1	.530	.158	.388	.160	.230	2.456	.239	.415	.179	.236	.430	.718	.492	.128	4.747
23 2	.530	.158	.388	.227	.230	2.456	.173	.415	.236	.179	.569	.571	.492	.128	1.933
23 3	.530	.158	.394	.299	.236	2.494	.168	.421	.304	.117	.723	.386	.492	.125	1.165
23 4	.530	.158	.444	.393	.286	2.810	.170	.470	.396	.074	.842	.227	.492	.105	.584
23 5	.530	.158	.694	.692	.536	4.392	.190	.719	.693	.026	.964	.054	.492	.053	.233
23 6	.530	.158	.966	.975	.808	6.114	.221	.991	.976	.015	.985	.023	.492	.033	.135
23 7	1.120	.265	.653	.210	.388	2.464	.771	.682	.258	.424	.379	.767	.479	.124	10.032
23 8	1.120	.265	.654	.170	.389	2.468	.328	.683	.244	.439	.357	.787	.479	.124	4.323
23 9	1.120	.265	.657	.322	.392	2.479	.282	.686	.343	.343	.499	.647	.479	.123	2.237
2310	1.120	.265	.664	.442	.399	2.506	.275	.693	.453	.240	.654	.471	.479	.121	1.386
2311	1.120	.265	.925	.878	.660	3.491	.283	.951	.881	.071	.926	.109	.479	.073	.359
2312	1.120	.265	1.207	1.194	.942	4.555	.299	1.232	1.195	.037	.970	.045	.479	.049	.213
2313	2.340	.447	1.067	.416	.620	2.387	1.161	1.099	.470	.629	.427	.721	.457	.124	11.737
2314	2.340	.447	1.069	.445	.622	2.391	.691	1.101	.492	.609	.447	.701	.457	.124	7.734
2315	2.340	.447	1.071	.441	.624	2.396	.525	1.103	.489	.614	.443	.705	.457	.123	4.854
2316	2.340	.447	1.078	.558	.631	2.412	.466	1.110	.588	.522	.530	.615	.457	.122	2.473
2317	2.340	.447	1.228	1.048	.781	2.747	.457	1.258	1.056	.202	.840	.231	.457	.100	.674
2318	2.340	.447	1.367	1.248	.920	3.058	.460	1.396	1.254	.142	.898	.149	.457	.085	.458

Table 2. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
24 1	.540	.415	.422	.427	.414	.352	.192	.207	.165	.113	.136	.156	.164	.187
24 2	.540	.415	.421	.426	.414	.355	.192	.234	.208	.180	.193	.203	.201	.226
24 3	.540	.416	.423	.429	.416	.357	.197	.301	.250	.247	.269	.250	.267	.285
24 4	.540	.436	.444	.449	.438	.384	.303	.345	.349	.353	.349	.353	.361	.369
24 5	.540	.720	.726	.732	.727	.733	.696	.711	.709	.710	.710	.714	.721	.730
24 6	.540	.992	1.000	1.005	1.002	.993	.988	.991	.994	.994	.997	1.000	1.007	1.015
24 7	1.120	.697	.685	.690	.672	.608	.341	.243	.232	.195	.129	.092	.279	.244
24 8	1.120	.681	.687	.691	.673	.609	.337	.257	.263	.234	.171	.189	.223	.280
24 9	1.120	.680	.687	.691	.696	.612	.342	.267	.309	.293	.285	.264	.289	.321
2410	1.120	.683	.692	.696	.681	.614	.357	.378	.472	.408	.379	.384	.397	.432
2411	1.120	.927	.931	.936	.928	.875	.826	.851	.864	.862	.870	.867	.881	.887
2412	1.120	1.193	1.201	1.206	1.202	1.166	1.146	1.166	1.170	1.170	1.173	1.178	1.182	1.191
2413	2.350	1.088	1.099	1.100	1.083	1.019	.659	.415	.300	.241	.200	.159	.143	.385
2414	2.350	1.089	1.098	1.100	1.080	1.009	.659	.415	.300	.239	.208	.188	.446	.465
2415	2.350	1.092	1.101	1.104	1.086	1.014	.659	.424	.223	.271	.249	.247	.441	.473
2416	2.350	1.097	1.109	1.110	1.090	1.018	.667	.450	.393	.419	.513	.507	.490	.550
2417	2.350	1.238	1.249	1.251	1.232	1.169	.892	.981	1.072	1.045	1.037	1.049	1.051	1.061
2418	2.350	1.396	1.407	1.411	1.396	1.354	1.169	1.246	1.278	1.277	1.278	1.280	1.282	1.299

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
24 1	.540	.136	.385	.157	.249	2.831	.287	.427	.177	.250	.415	.733	.628	.132	5.371
24 2	.540	.136	.385	.196	.249	2.831	.161	.427	.209	.218	.490	.657	.628	.132	2.211
24 3	.540	.136	.386	.255	.250	2.838	.156	.428	.263	.165	.614	.519	.628	.131	1.882
24 4	.540	.136	.406	.339	.270	2.985	.150	.447	.343	.104	.767	.328	.628	.122	.900
24 5	.540	.136	.690	.700	.554	5.074	.179	.729	.701	.028	.961	.058	.628	.055	.236
24 6	.540	.136	.962	.985	.826	7.074	.222	1.001	.986	.015	.985	.023	.628	.033	.137
24 7	1.120	.225	.667	.214	.442	2.964	3.128	.710	.261	.450	.367	.778	.612	.120	17.254
24 8	1.120	.225	.651	.250	.426	2.893	.350	.694	.284	.410	.409	.738	.612	.124	5.031
24 9	1.120	.225	.650	.291	.425	2.889	.251	.693	.316	.377	.456	.692	.612	.125	2.353
2410	1.120	.225	.653	.402	.428	2.902	.240	.696	.415	.281	.596	.540	.612	.124	1.424
2411	1.120	.225	.897	.857	.672	3.987	.249	.938	.860	.078	.917	.122	.612	.077	.375
2412	1.120	.225	1.163	1.161	.938	5.169	.269	1.203	1.163	.040	.966	.050	.612	.052	.226
2413	2.350	.379	1.058	.355	.679	2.792	2.185	1.105	.430	.675	.389	.758	.588	.126	14.713
2414	2.350	.379	1.059	.435	.680	2.794	.867	1.106	.485	.621	.438	.710	.588	.126	8.899
2415	2.350	.379	1.062	.443	.683	2.802	.607	1.109	.491	.618	.443	.705	.588	.125	6.592
2416	2.350	.379	1.067	.520	.688	2.815	.407	1.114	.555	.559	.498	.648	.588	.124	2.555
2417	2.350	.379	1.208	1.031	.829	3.187	.393	1.253	1.040	.213	.830	.244	.588	.103	.698
2418	2.350	.379	1.366	1.269	.987	3.604	.398	1.409	1.275	.135	.905	.140	.588	.086	.460

Table 2. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
25 1	.490	.377	.388	.399	.386	.332	.181	.198	.145	.085	.091	.133	.150	.172
25 2	.490	.377	.389	.399	.388	.330	.180	.237	.190	.173	.188	.190	.204	.227
25 3	.490	.378	.390	.402	.390	.332	.193	.278	.255	.274	.252	.259	.279	.299
25 4	.490	.429	.442	.450	.442	.396	.376	.387	.390	.387	.390	.400	.405	.419
25 5	.490	.690	.702	.710	.709	.696	.682	.696	.700	.700	.707	.707	.714	.728
25 6	.490	.988	1.000	1.008	1.010	1.004	1.000	1.006	1.008	1.009	1.013	1.015	1.023	1.036
25 7	1.130	.668	.680	.689	.676	.608	.334	.237	.225	.188	.122	.074	.256	.279
25 8	1.130	.670	.681	.690	.675	.611	.343	.247	.245	.212	.145	.139	.222	.269
25 9	1.130	.670	.682	.690	.678	.613	.349	.260	.296	.283	.278	.259	.286	.321
2510	1.130	.673	.685	.692	.683	.614	.353	.406	.403	.447	.356	.403	.222	.433
2511	1.130	.941	.954	.691	.956	.909	.859	.877	.893	.900	.905	.915	.918	.930
2512	1.130	1.226	1.238	1.248	1.246	1.216	1.201	1.216	1.224	.221	1.224	1.227	1.238	1.257
2513	2.450	1.107	1.115	1.124	1.111	1.036	.686	.451	.304	.224	.201	.163	.138	.340
2514	2.450	1.105	1.118	1.126	1.112	1.045	.683	.435	.307	.245	.205	.187	.465	.480
2515	2.450	1.106	1.119	1.127	1.110	1.036	.687	.433	.314	.250	.205	.196	.488	.508
2516	2.450	1.115	1.126	1.136	1.122	1.049	.702	.469	.389	.382	.512	.529	.516	.559
2517	2.450	1.238	1.249	1.258	1.244	1.176	.882	.955	1.064	1.027	1.023	1.040	1.032	1.058
2518	2.450	1.390	1.403	1.408	1.400	1.342	1.165	1.245	1.275	1.266	1.269	1.266	1.286	1.298

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
25 1	.490	.110	.347	.142	.237	3.155	.854	.410	.162	.248	.395	.751	.784	.140	9.035
25 2	.490	.110	.347	.197	.237	3.155	.142	.410	.208	.203	.506	.640	.784	.140	2.155
25 3	.490	.110	.348	.269	.238	3.164	.135	.411	.275	.137	.668	.454	.784	.139	1.771
25 4	.490	.110	.399	.389	.289	3.627	.133	.462	.392	.070	.849	.218	.784	.113	.573
25 5	.490	.110	.660	.698	.550	6.000	.173	.721	.699	.022	.969	.046	.784	.053	.221
25 6	.490	.110	.958	1.006	.848	8.709	.241	1.018	1.006	.012	.988	.018	.784	.030	.124
25 7	1.130	.194	.638	.249	.444	3.289	16.007	.703	.284	.419	.404	.743	.772	.129	29.117
25 8	1.130	.194	.640	.239	.446	3.299	.642	.705	.277	.428	.393	.754	.772	.129	7.468
25 9	1.130	.194	.640	.291	.446	3.299	.232	.705	.317	.389	.449	.699	.772	.129	2.452
2510	1.130	.194	.643	.403	.449	3.314	.256	.708	.416	.292	.588	.549	.772	.128	3.194
2511	1.130	.194	.911	.930	.717	4.696	.219	.974	.903	.071	.927	.107	.772	.076	.500
2512	1.130	.194	1.196	1.227	1.002	6.165	.257	1.258	1.228	.029	.977	.034	.772	.050	3.219
2513	2.450	.333	1.077	.310	.744	3.234	3.633	1.146	.416	.729	.363	.781	.744	.128	16.417
2514	2.450	.333	1.075	.450	.742	3.228	1.095	1.144	.500	.643	.438	.711	.744	.128	9.366
2515	2.450	.333	1.076	.478	.743	3.231	.947	1.145	.523	.622	.457	.691	.744	.128	8.615
2516	2.450	.333	1.085	.529	.752	3.258	.379	1.154	.566	.588	.490	.657	.744	.126	2.790
2517	2.450	.333	1.208	1.028	.875	3.628	.351	1.275	1.038	.237	.814	.266	.744	.108	.741
2518	2.450	.333	1.360	1.268	1.027	4.084	.358	1.426	1.274	.151	.894	.155	.744	.090	.482

Table 2. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
31 1	.510	.285	.280	.278	.262	.239	.215	.216	.220	.222	.217	.213	.219	.225
31 2	.510	.289	.287	.286	.268	.249	.232	.235	.231	.231	.233	.236	.233	.242
31 3	.510	.310	.309	.307	.303	.276	.262	.279	.262	.267	.268	.266	.266	.273
31 4	.510	.285	.284	.281	.265	.244	.226	.219	.225	.227	.224	.223	.229	.235
31 5	.510	.490	.489	.490	.482	.478	.472	.473	.472	.470	.469	.472	.473	.476
31 6	.510	.700	.701	.700	.694	.694	.690	.689	.689	.687	.688	.689	.689	.692
31 7	.510	.860	.861	.859	.854	.854	.851	.851	.850	.849	.849	.849	.850	.853
31 8	1.306	.496	.469	.467	.438	.393	.294	.233	.310	.282	.246	.289	.298	.322
31 9	1.306	.472	.472	.468	.440	.397	.307	.255	.382	.284	.300	.333	.309	.332
3110	1.306	.471	.471	.468	.439	.392	.298	.243	.383	.284	.267	.314	.307	.325
3111	1.306	.520	.520	.518	.494	.459	.399	.441	.393	.454	.409	.452	.431	.448
3112	1.306	.707	.707	.706	.693	.673	.657	.661	.665	.659	.665	.662	.664	.669
3113	1.306	.896	.896	.895	.886	.878	.869	.867	.867	.865	.867	.866	.868	.871
3114	1.306	1.092	1.094	1.092	1.084	1.077	1.072	1.073	1.073	1.072	1.075	1.072	1.075	1.077
3115	2.595	.738	.736	.734	.691	.637	.493	.346	.265	.245	.279	.383	.435	.432
3116	2.595	.739	.737	.736	.691	.641	.499	.351	.270	.265	.319	.377	.392	.421
3117	2.595	.742	.742	.738	.698	.649	.514	.371	.358	.559	.506	.430	.438	.494
3118	2.595	.772	.770	.768	.738	.681	.572	.557	.615	.589	.604	.607	.613	.638
3119	2.595	.980	.983	.983	.955	.822	.859	.894	.873	.882	.881	.886	.892	.903
3120	2.595	1.178	1.181	1.179	1.162	1.129	1.113	1.119	1.121	1.113	1.117	1.119	1.125	1.129
3121	2.595	1.376	1.380	1.377	1.364	1.351	1.331	1.327	1.330	1.329	1.334	1.331	1.334	1.339
3122	4.450	1.027	1.030	1.023	.976	.919	.762	.534	.370	.295	.281	.409	.584	.615
3123	4.450	1.024	1.021	1.023	.973	.929	.741	.526	.378	.305	.326	.521	.613	.628
3124	4.450	1.028	1.028	1.024	.983	.926	.752	.536	.390	.331	.392	.569	.662	.654
3125	4.450	1.066	1.069	1.067	1.025	.959	.813	.624	.676	.835	.794	.743	.747	.785
3126	4.450	1.199	1.201	1.204	1.163	1.117	.992	.993	1.030	1.019	1.034	1.039	1.041	1.079
3127	4.450	1.352	1.356	1.350	1.328	1.272	1.175	1.219	1.221	1.209	1.216	1.221	1.230	1.248
3128	4.450	1.410	1.414	1.413	1.390	1.366	1.250	1.283	1.304	1.262	1.289	1.282	1.292	1.313

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	F8
31 1	.510	.000	.255	.195	.000	.000	.000	.262	.207	.055	.789	.299	.000	.231	.765
31 2	.510	.000	.259	.212	.000	.000	.000	.266	.222	.044	.835	.237	.000	.226	.665
31 3	.510	.000	.280	.243	.000	.000	.000	.286	.250	.035	.877	.179	.000	.201	.536
31 4	.510	.000	.255	.205	.000	.000	.000	.262	.216	.046	.823	.253	.000	.231	.729
31 5	.510	.000	.460	.446	.000	.000	.000	.462	.448	.014	.970	.045	.000	.095	.206
31 6	.510	.000	.670	.662	.000	.000	.000	.671	.663	.008	.988	.018	.000	.054	.113
31 7	.510	.000	.830	.823	.000	.000	.000	.831	.824	.007	.992	.013	.000	.039	.081
31 8	1.306	.000	.466	.292	.000	.000	.000	.479	.326	.153	.680	.439	.000	.240	1.678
31 9	1.306	.000	.442	.302	.000	.000	.000	.457	.334	.123	.731	.375	.000	.259	1.438
3110	1.306	.000	.441	.295	.000	.000	.000	.456	.328	.128	.720	.389	.000	.260	1.561
3111	1.306	.000	.490	.418	.000	.000	.000	.502	.435	.067	.866	.195	.000	.222	.702
3112	1.306	.000	.677	.639	.000	.000	.000	.683	.646	.037	.946	.081	.000	.137	.309
3113	1.306	.000	.866	.841	.000	.000	.000	.870	.845	.025	.972	.042	.000	.095	.201
3114	1.306	.000	1.062	1.047	.000	.000	.000	1.065	1.050	.015	.986	.021	.000	.070	.144
3115	2.595	.000	.708	.402	.000	.000	.000	.731	.473	.258	.647	.479	.000	.254	3.058
3116	2.595	.000	.709	.391	.000	.000	.000	.732	.466	.266	.637	.492	.000	.254	2.676
3117	2.595	.000	.712	.464	.000	.000	.000	.735	.517	.217	.704	.409	.000	.252	1.623
3118	2.595	.000	.742	.608	.000	.000	.000	.763	.639	.124	.838	.233	.000	.237	.797
3119	2.595	.000	.950	.873	.000	.000	.000	.963	.888	.075	.922	.114	.000	.164	.433
3120	2.595	.000	1.148	1.099	.000	.000	.000	1.157	1.108	.048	.958	.062	.000	.123	.271
3121	2.595	.000	1.346	1.309	.000	.000	.000	1.352	1.316	.037	.973	.040	.000	.097	.206
3122	4.450	.000	.997	.585	.000	.000	.000	1.031	.684	.347	.663	.460	.000	.261	4.157
3123	4.450	.000	.994	.598	.000	.000	.000	1.028	.692	.336	.673	.447	.000	.262	3.625
3124	4.450	.000	.998	.624	.000	.000	.000	1.032	.711	.321	.689	.429	.000	.260	3.166
3125	4.450	.000	1.036	.755	.000	.000	.000	1.067	.814	.253	.763	.334	.000	.246	1.142
3126	4.450	.000	1.169	1.049	.000	.000	.000	1.194	1.080	.114	.904	.140	.000	.205	.554
3127	4.450	.000	1.322	1.218	.000	.000	.000	1.341	1.241	.101	.925	.110	.000	.171	.427
3128	4.450	.000	1.380	1.283	.000	.000	.000	1.398	1.303	.094	.933	.099	.000	.160	.388

Table 2. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
32 1	.506	.266	.268	.269	.252	.299	.201	.206	.202	.186	.194	.203	.209	.221
32 2	.506	.270	.270	.270	.255	.231	.206	.210	.215	.203	.197	.209	.214	.231
32 3	.506	.266	.268	.269	.253	.227	.205	.207	.207	.189	.196	.204	.210	.223
32 4	.506	.340	.343	.341	.333	.322	.314	.314	.315	.319	.319	.319	.320	.328
32 5	.506	.522	.524	.525	.521	.517	.514	.513	.515	.514	.516	.517	.518	.523
32 6	.506	.709	.713	.715	.712	.710	.708	.709	.709	.709	.709	.711	.705	.716
32 7	.506	.907	.910	.912	.910	.909	.909	.908	.907	.906	.909	.909	.915	.911
32 8	1.254	.450	.452	.452	.427	.279	.291	.222	.263	.269	.236	.272	.281	.296
32 9	1.254	.450	.453	.452	.428	.523	.432	.373	.319	.412	.406	.435	.295	.314
3210	1.254	.463	.465	.464	.440	.396	.319	.317	.368	.311	.374	.329	.368	.377
3211	1.254	.492	.494	.495	.473	.436	.379	.413	.383	.413	.394	.423	.402	.428
3212	1.254	.710	.710	.712	.702	.689	.674	.677	.674	.675	.679	.682	.684	.688
3213	1.254	.897	.899	.901	.894	.886	.880	.880	.879	.879	.879	.880	.885	.889
3214	1.254	1.106	1.113	1.110	1.110	1.104	1.100	1.096	1.100	1.098	1.009	1.102	1.103	1.110
3215	2.510	.712	.711	.709	.678	.621	.482	.337	.261	.247	.284	.364	.451	.425
3216	2.510	.706	.708	.708	.677	.612	.491	.438	.276	.309	.387	.407	.405	.431
3217	2.510	.718	.719	.722	.731	.621	.493	.377	.450	.544	.471	.436	.488	.554
3218	2.510	.783	.778	.787	.761	.709	.609	.651	.660	.649	.664	.654	.673	.685
3219	2.510	.967	.967	.968	.948	.914	.870	.895	.876	.890	.879	.884	.893	.902
3220	2.510	1.114	1.149	1.148	1.132	1.113	1.089	1.095	1.096	1.088	1.093	1.095	1.099	1.112
3221	2.510	1.335	1.337	1.339	1.330	1.315	1.299	1.301	1.303	1.299	1.301	1.303	1.307	1.314
3222	4.258	.998	.997	.996	.950	.889	.736	.509	.360	.284	.249	.280	.536	.550
3223	4.258	.995	.990	.989	.961	.891	.734	.516	.362	.292	.299	.434	.569	.602
3224	4.258	.990	1.000	.996	1.049	.889	.739	.518	.382	.328	.341	.491	.605	.603
3225	4.258	1.011	1.014	1.015	1.080	.916	.746	.556	.475	.543	.646	.751	.676	.753
3226	4.258	1.187	1.185	1.188	1.156	1.104	.992	1.015	1.037	1.024	1.039	1.033	1.048	1.081
3227	4.258	1.333	1.330	1.333	1.311	1.267	1.179	1.214	1.200	1.004	1.219	1.212	1.231	1.250
3228	4.258	1.395	1.394	1.394	1.373	1.333	1.247	1.287	1.285	1.269	1.279	1.294	1.296	1.320

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
32 1	.506	.182	.236	.191	.054	1.297	.185	.258	.203	.055	.786	.303	.380	.258	.965
32 2	.506	.182	.240	.201	.058	1.319	.185	.262	.212	.050	.808	.273	.380	.251	.871
32 3	.506	.182	.236	.193	.054	1.297	.185	.258	.205	.054	.793	.294	.380	.258	.938
32 4	.506	.182	.310	.298	.128	1.703	.187	.329	.303	.026	.921	.116	.380	.171	.393
32 5	.506	.182	.492	.493	.310	2.703	.194	.508	.495	.013	.974	.039	.380	.086	.177
32 6	.506	.182	.679	.686	.497	3.731	.206	.694	.687	.007	.989	.016	.380	.053	.107
32 7	.506	.182	.877	.881	.695	4.819	.222	.892	.882	.010	.988	.017	.380	.036	.073
32 8	1.254	.344	.420	.266	.076	1.221	.347	.450	.304	.146	.676	.444	.363	.269	1.751
32 9	1.254	.344	.420	.284	.076	1.221	.347	.450	.317	.132	.706	.407	.363	.269	1.080
3210	1.254	.344	.433	.347	.089	1.259	.347	.462	.369	.092	.800	.285	.363	.257	.989
3211	1.254	.344	.462	.398	.118	1.343	.347	.489	.415	.074	.849	.218	.363	.233	.715
3212	1.254	.344	.680	.658	.336	1.977	.350	.700	.664	.036	.949	.076	.363	.130	.285
3213	1.254	.344	.867	.859	.523	2.520	.355	.885	.863	.022	.975	.038	.363	.091	.188
3214	1.254	.344	1.076	1.080	.732	3.128	.358	1.093	1.082	.010	.990	.014	.363	.066	.152
3215	2.510	.567	.682	.395	.115	1.203	.574	.719	.464	.256	.645	.482	.343	.260	2.917
3216	2.510	.567	.676	.401	.109	1.192	.572	.714	.468	.246	.655	.470	.343	.264	2.417
3217	2.510	.567	.688	.524	.121	1.213	.570	.725	.563	.162	.777	.316	.343	.257	1.443
3218	2.510	.567	.753	.655	.186	1.328	.570	.786	.680	.106	.865	.196	.343	.224	.669
3219	2.510	.567	.937	.872	.370	1.653	.571	.964	.886	.078	.920	.118	.343	.161	.383
3220	2.510	.567	1.084	1.082	.517	1.912	.573	1.108	1.091	.016	.985	.022	.343	.130	.271
3221	2.510	.567	1.305	1.284	.738	2.302	.576	1.326	1.291	.035	.973	.040	.343	.098	.206
3222	4.258	.840	.968	.520	.128	1.152	.859	1.015	.634	.381	.625	.506	.323	.261	4.881
3223	4.258	.840	.965	.572	.125	1.149	.850	1.013	.666	.346	.658	.466	.323	.262	3.730
3224	4.258	.840	.960	.573	.120	1.143	.847	1.008	.667	.341	.662	.462	.323	.264	3.075
3225	4.258	.840	.981	.723	.141	1.168	.843	1.027	.782	.245	.761	.336	.323	.256	1.685
3226	4.258	.840	1.157	1.051	.317	1.377	.843	1.194	1.079	.116	.903	.141	.323	.200	.530
3227	4.258	.840	1.303	1.220	.463	1.551	.843	1.336	1.241	.095	.929	.105	.323	.167	.520
3228	4.258	.840	1.365	1.290	.525	1.625	.844	1.396	1.309	.087	.937	.092	.323	.156	.373

Table 2. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
33 1	.468	.248	.250	.251	.240	.214	.189	.195	.194	.179	.179	.185	.198	.207
33 2	.468	.261	.263	.266	.256	.234	.219	.217	.218	.217	.225	.227	.229	.239
33 3	.468	.250	.254	.256	.243	.222	.196	.197	.202	.194	.191	.191	.202	.221
33 4	.468	.289	.293	.295	.288	.273	.263	.265	.263	.263	.262	.259	.267	.279
33 5	.468	.492	.496	.499	.496	.494	.491	.492	.492	.491	.494	.496	.496	.504
33 6	.468	.688	.691	.694	.695	.695	.693	.693	.692	.693	.694	.696	.698	.704
33 7	.468	.934	.940	.942	.943	.943	.941	.941	.942	.942	.942	.944	.947	.955
33 8	1.219	.660	.667	.669	.663	.645	.624	.626	.630	.000	.000	.000	.636	.645
33 9	1.219	.633	.637	.640	.633	.613	.592	.595	.598	.000	.000	.000	.600	.609
3310	1.219	.546	.549	.552	.540	.511	.467	.500	.470	.000	.000	.000	.484	.499
3311	1.219	.458	.462	.464	.464	.397	.299	.221	.229	.000	.000	.000	.265	.299
3312	1.219	.825	.828	.831	.829	.819	.811	.804	.808	.000	.000	.000	.813	.823
3313	1.219	1.029	1.033	1.037	1.036	1.029	1.027	1.024	1.024	.000	.000	.000	1.027	1.034
3314	1.308	.468	.473	.474	.451	.409	.428	.325	.380	.322	.333	.341	.375	.390
3315	1.308	.459	.462	.463	.438	.294	.297	.251	.365	.291	.279	.319	.318	.337
3316	2.431	.690	.696	.698	.668	.608	.478	.322	.245	.000	.000	.000	.448	.409
3317	2.431	.690	.696	.699	.662	.608	.476	.323	.250	.000	.000	.000	.450	.414
3318	2.431	.691	.697	.699	.668	.607	.483	.434	.284	.000	.000	.000	.392	.426
3319	2.431	.701	.703	.705	.676	.622	.592	.474	.472	.000	.000	.000	.502	.554
3320	2.431	.749	.753	.755	.735	.684	.586	.608	.641	.000	.000	.000	.632	.654
3321	2.431	.878	.883	.886	.868	.829	.764	.797	.800	.000	.000	.000	.808	.823
3322	2.431	1.059	1.064	1.066	1.058	1.032	1.007	1.013	1.012	.000	.000	.000	1.015	1.021
3323	4.218	.982	.986	.984	.948	.892	.744	.504	.358	.279	.245	.250	.425	.497
3324	4.218	.980	.986	.986	.952	.892	.738	.506	.361	.294	.302	.495	.617	.605
3325	4.218	.982	.985	.986	.954	.891	.733	.509	.371	.304	.354	.546	.670	.625
3326	4.218	1.026	1.037	1.034	1.003	.946	.797	.642	.776	.832	.793	.779	.793	.855
3327	4.218	1.004	1.010	1.007	.973	.906	.764	.567	.494	.644	.794	.739	.646	.751
3328	4.218	1.154	1.161	1.160	1.125	1.076	.949	.984	.985	.999	.999	.996	1.019	1.056
3329	4.218	1.345	1.345	1.348	1.325	1.279	1.194	1.234	1.238	1.217	1.239	1.243	1.241	1.259

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
33 1	.468	.145	.218	.177	.073	1.503	.149	.250	.189	.061	.756	.343	.495	.268	.956
33 2	.468	.145	.231	.209	.086	1.593	.149	.262	.218	.044	.830	.243	.495	.246	.680
33 3	.468	.145	.220	.191	.075	1.517	.149	.252	.201	.050	.799	.285	.495	.265	.851
33 4	.468	.145	.259	.249	.114	1.786	.150	.289	.255	.034	.884	.169	.495	.207	.502
33 5	.468	.145	.462	.474	.317	3.186	.163	.488	.476	.012	.975	.037	.495	.087	.176
33 6	.468	.145	.658	.674	.513	4.538	.180	.683	.675	.008	.988	.018	.495	.051	.103
33 7	.468	.145	.904	.925	.759	6.234	.211	.928	.925	.003	.997	.005	.495	.032	.064
33 8	1.219	.281	.630	.615	.349	2.242	.289	.660	.622	.039	.941	.087	.478	.142	.313
33 9	1.219	.281	.603	.579	.322	2.146	.289	.634	.587	.047	.925	.110	.478	.152	.340
3310	1.219	.281	.516	.469	.235	1.836	.286	.550	.481	.069	.874	.182	.478	.192	.496
3311	1.219	.281	.428	.269	.147	1.523	.286	.466	.304	.162	.653	.473	.478	.254	1.716
3312	1.219	.281	.795	.793	.514	2.829	.294	.823	.797	.026	.968	.047	.478	.100	.210
3313	1.219	.281	.999	1.004	.718	3.555	.303	1.026	1.007	.019	.981	.028	.478	.071	.145
3314	1.308	.296	.438	.360	.142	1.480	.300	.477	.382	.095	.802	.282	.474	.263	.974
3315	1.308	.296	.429	.307	.133	1.449	.300	.469	.338	.131	.721	.388	.474	.272	1.479
3316	2.431	.460	.660	.379	.200	1.435	.470	.707	.449	.258	.635	.494	.455	.265	2.865
3317	2.431	.460	.660	.384	.200	1.435	.469	.707	.452	.255	.640	.489	.455	.265	2.768
3318	2.431	.460	.661	.396	.201	1.437	.466	.708	.460	.248	.650	.476	.455	.264	2.231
3319	2.431	.460	.671	.524	.211	1.459	.463	.717	.561	.157	.782	.309	.455	.258	.972
3320	2.431	.460	.719	.624	.259	1.563	.464	.762	.650	.113	.852	.213	.455	.233	.689
3321	2.431	.460	.848	.793	.388	1.843	.465	.886	.809	.077	.913	.127	.455	.182	.454
3322	2.431	.460	1.029	.991	.569	2.237	.468	1.063	1.001	.061	.942	.085	.455	.136	.296
3323	4.218	.689	.952	.467	.263	1.382	.719	1.009	.606	.404	.600	.535	.430	.265	4.971
3324	4.218	.689	.950	.575	.261	1.379	.704	1.008	.667	.341	.662	.462	.430	.266	3.653
3325	4.218	.689	.952	.595	.263	1.382	.702	1.009	.681	.329	.674	.446	.430	.265	3.455
3326	4.218	.689	.996	.825	.307	1.446	.692	1.051	.870	.181	.828	.247	.430	.248	1.035
3327	4.218	.689	.974	.721	.285	1.414	.693	1.030	.779	.251	.757	.342	.430	.256	1.568
3328	4.218	.689	1.124	1.026	.435	1.631	.693	1.172	1.055	.117	.900	.146	.430	.207	.562
3329	4.218	.689	1.315	1.229	.626	1.909	.695	1.357	1.249	.107	.921	.116	.430	.163	.395

Table 2. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
34 1	.606	.250	.254	.259	.248	.222	.175	.194	.157	.193	.184	.164	.186	.204
34 2	.606	.253	.257	.261	.250	.225	.186	.203	.176	.191	.209	.186	.197	.223
34 3	.606	.259	.264	.268	.258	.232	.203	.214	.205	.194	.211	.223	.223	.240
34 4	.606	.308	.317	.319	.312	.299	.289	.294	.292	.295	.295	.297	.303	.314
34 5	.606	.503	.509	.515	.516	.509	.509	.512	.513	.513	.515	.519	.522	.531
34 6	.606	.695	.704	.709	.712	.709	.709	.713	.714	.712	.715	.717	.719	.729
34 7	.606	.871	.880	.885	.888	.887	.886	.887	.889	.890	.891	.893	.896	.905
34 8	1.143	.409	.416	.420	.400	.355	.264	.202	.232	.233	.196	.233	.247	.272
34 9	1.143	.408	.416	.419	.400	.359	.269	.219	.291	.245	.238	.272	.278	.300
3410	1.143	.415	.420	.425	.408	.367	.292	.278	.347	.297	.339	.300	.305	.352
3411	1.143	.448	.456	.459	.444	.410	.357	.400	.359	.413	.372	.406	.391	.414
3412	1.143	.620	.629	.633	.624	.613	.600	.600	.612	.605	.604	.612	.616	.626
3413	1.143	.810	.818	.822	.819	.812	.805	.809	.807	.809	.813	.813	.819	.829
3414	1.143	.989	.996	1.007	1.004	1.000	.995	.995	.997	.995	1.000	1.002	1.006	1.018
3415	2.450	.689	.694	.700	.669	.613	.477	.324	.245	.213	.247	.394	.431	.388
3416	2.450	.687	.695	.699	.696	.607	.470	.324	.247	.230	.390	.415	.482	.424
3417	2.450	.689	.695	.699	.667	.611	.479	.339	.286	.425	.412	.421	.405	.467
3418	2.450	.699	.706	.709	.683	.613	.493	.392	.537	.526	.491	.519	.552	.569
3419	2.450	.855	.867	.880	.860	.816	.754	.794	.780	.796	.786	.797	.803	.822
3420	2.450	1.043	1.051	1.058	1.042	1.015	.987	.996	.992	1.000	1.002	1.008	1.016	1.030
3421	2.450	1.200	1.211	1.214	1.201	1.187	1.170	1.169	1.178	1.173	1.176	1.181	1.190	1.200
3422	4.180	.970	.983	.983	.953	.877	.723	.500	.358	.284	.229	.212	.262	.425
3423	4.180	.974	.978	.974	.949	.900	.735	.502	.360	.283	.281	.395	.577	.612
3424	4.180	.977	.980	.978	.951	.887	.737	.504	.373	.309	.349	.553	.647	.626
3425	4.180	.981	.980	.983	.956	.894	.745	.515	.395	.359	.374	.544	.610	.598
3426	4.180	1.130	1.136	1.140	1.112	1.052	.939	.944	.986	.982	.984	.994	1.009	1.048
3427	4.180	1.265	1.272	1.274	1.250	1.212	1.114	1.159	1.160	1.149	1.169	1.159	1.176	1.206
3428	4.180	1.368	1.372	1.378	1.363	1.309	1.242	1.274	1.270	1.273	1.289	1.287	1.301	1.318

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
34 1	.606	.147	.220	.174	.073	1.497	.153	.271	.195	.077	.717	.392	.627	.343	1.573
34 2	.606	.147	.223	.193	.076	1.517	.153	.274	.210	.064	.766	.330	.627	.336	1.276
34 3	.606	.147	.229	.210	.082	1.558	.152	.279	.224	.055	.803	.281	.627	.323	1.072
34 4	.606	.147	.278	.284	.131	1.891	.154	.324	.292	.033	.899	.147	.627	.241	.540
34 5	.606	.147	.473	.501	.326	3.218	.165	.514	.503	.011	.979	.031	.627	.109	.219
34 6	.606	.147	.665	.699	.518	4.524	.182	.705	.700	.005	.994	.010	.627	.065	.131
34 7	.606	.147	.841	.875	.694	5.721	.203	.880	.876	.004	.995	.008	.627	.046	.092
34 8	1.143	.228	.379	.242	.151	1.662	.236	.433	.280	.153	.647	.480	.613	.286	1.985
34 9	1.143	.228	.378	.270	.150	1.658	.234	.432	.301	.131	.696	.420	.613	.287	1.634
3410	1.143	.228	.385	.322	.157	1.689	.233	.438	.343	.095	.783	.307	.613	.279	1.087
3411	1.143	.228	.418	.384	.190	1.833	.234	.469	.399	.070	.851	.215	.613	.247	.718
3412	1.143	.228	.590	.596	.362	2.588	.240	.635	.602	.033	.949	.076	.613	.147	.312
3413	1.143	.228	.780	.799	.552	3.421	.248	.822	.802	.020	.976	.035	.613	.097	.197
3414	1.143	.228	.959	.988	.731	4.206	.259	1.000	.990	.010	.990	.014	.613	.071	.143
3415	2.450	.391	.659	.358	.268	1.685	.413	.721	.438	.283	.607	.527	.585	.267	3.677
3416	2.450	.391	.657	.394	.266	1.680	.408	.719	.460	.259	.639	.489	.585	.268	3.218
3417	2.450	.391	.659	.437	.268	1.685	.400	.721	.491	.230	.680	.439	.585	.267	2.222
3418	2.450	.391	.669	.539	.278	1.711	.396	.730	.574	.156	.786	.303	.585	.261	1.322
3419	2.450	.391	.825	.792	.434	2.110	.398	.878	.808	.070	.920	.117	.585	.191	.467
3420	2.450	.391	1.013	1.000	.622	2.591	.402	1.061	1.010	.051	.952	.071	.585	.140	.307
3421	2.450	.391	1.170	1.170	.779	2.992	.406	1.216	1.177	.038	.968	.047	.585	.113	.237
3422	4.180	.575	.940	.395	.365	1.635	.650	1.012	.586	.426	.579	.560	.559	.268	6.325
3423	4.180	.575	.944	.582	.369	1.642	.599	1.016	.670	.346	.659	.465	.559	.266	3.905
3424	4.180	.575	.947	.596	.372	1.647	.592	1.019	.680	.339	.667	.455	.559	.265	3.332
3425	4.180	.575	.951	.568	.376	1.654	.586	1.022	.660	.362	.646	.481	.559	.263	2.602
3426	4.180	.575	1.100	1.018	.525	1.913	.581	1.163	1.047	.116	.900	.146	.559	.211	.567
3427	4.180	.575	1.235	1.176	.660	2.148	.582	1.293	1.198	.095	.926	.109	.559	.178	.435
3428	4.180	.575	1.338	1.288	.763	2.327	.584	1.393	1.306	.087	.937	.092	.559	.158	.368

Table 2. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
35 1	.460	.214	.223	.231	.222	.197	.154	.167	.132	.164	.157	.142	.160	.185
35 2	.460	.219	.228	.235	.231	.203	.169	.183	.166	.158	.184	.134	.187	.209
35 3	.460	.214	.224	.230	.224	.200	.156	.167	.135	.160	.167	.149	.164	.195
35 4	.460	.238	.248	.256	.252	.236	.224	.230	.225	.223	.233	.236	.238	.252
35 5	.460	.460	.471	.482	.485	.482	.483	.485	.489	.488	.493	.495	.498	.511
35 6	.460	.605	.616	.626	.630	.630	.630	.630	.635	.636	.639	.642	.647	.652
35 7	.460	.813	.825	.835	.839	.843	.840	.843	.844	.847	.849	.852	.858	.869
35 8	1.237	.414	.426	.434	.416	.374	.286	.203	.188	.209	.169	.220	.198	.270
35 9	1.237	.415	.427	.434	.418	.376	.282	.214	.245	.274	.238	.276	.285	.311
3510	1.237	.428	.436	.445	.429	.418	.312	.309	.365	.314	.374	.331	.372	.381
3511	1.237	.422	.431	.439	.425	.381	.299	.269	.368	.279	.362	.327	.323	.351
3512	1.237	.650	.657	.669	.668	.653	.639	.649	.652	.647	.654	.662	.662	.677
3513	1.237	.832	.844	.852	.818	.844	.838	.842	.844	.844	.849	.854	.857	.873
3514	1.237	1.044	1.053	1.064	1.066	1.064	1.060	1.061	1.065	1.065	1.069	1.070	1.075	1.089
3515	2.607	.698	.713	.717	.693	.630	.489	.339	.252	.217	.211	.291	.434	.403
3516	2.607	.701	.709	.718	.688	.628	.491	.337	.253	.216	.244	.383	.447	.404
3517	2.607	.701	.711	.718	.690	.642	.504	.353	.395	.323	.417	.439	.423	.463
3518	2.607	.700	.735	.742	.716	.668	.652	.511	.593	.578	.586	.600	.611	.650
3519	2.607	.900	.913	.920	.908	.872	.806	.851	.841	.834	.850	.836	.858	.880
3520	2.607	1.095	1.107	1.117	1.105	1.073	1.059	1.066	1.060	1.069	1.076	1.069	1.081	1.096
3521	2.607	1.261	1.270	1.282	1.276	1.259	1.241	1.251	1.255	1.251	1.256	1.261	1.266	1.277
3522	4.520	1.005	1.016	1.022	.996	.926	.757	.533	.380	.293	.245	.219	.249	.396
3523	4.520	1.005	1.016	1.001	.993	.919	.774	.533	.374	.393	.254	.224	.254	.470
3524	4.520	1.009	1.017	1.022	.989	.823	.787	.552	.410	.386	.419	.509	.606	.630
3525	4.520	1.014	1.031	1.039	1.006	.930	.759	.559	.440	.414	.473	.629	.670	.650
3526	4.520	1.153	1.170	1.172	1.149	1.099	.971	1.037	1.010	1.011	1.024	1.024	1.037	1.077
3527	4.520	1.299	1.312	1.322	1.298	1.259	1.162	1.219	1.202	1.191	1.204	1.212	1.220	1.254
3528	4.520	1.353	1.365	1.373	1.353	1.314	1.217	1.254	1.270	1.259	1.259	1.259	1.281	1.319

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E1S	FN	F1	FB
35 1	.460	.105	.184	.155	.079	1.752	.114	.255	.170	.085	.668	.455	.789	.340	1.659
35 2	.460	.105	.189	.179	.084	1.800	.114	.259	.190	.069	.734	.371	.789	.327	1.611
35 3	.460	.105	.184	.165	.079	1.752	.114	.255	.178	.076	.700	.414	.789	.340	1.588
35 4	.460	.105	.208	.222	.103	1.981	.113	.276	.229	.047	.830	.244	.789	.283	.637
35 5	.460	.105	.430	.481	.325	4.095	.135	.492	.483	.009	.981	.028	.789	.095	.192
35 6	.460	.105	.575	.622	.470	5.476	.157	.636	.623	.013	.979	.031	.789	.062	.124
35 7	.460	.105	.783	.839	.678	7.457	.200	.844	.840	.004	.995	.007	.789	.039	.078
35 8	1.237	.207	.384	.240	.177	1.855	.226	.462	.285	.176	.618	.514	.766	.303	2.804
35 9	1.237	.207	.385	.281	.178	1.860	.217	.463	.314	.149	.679	.441	.766	.302	1.841
3510	1.237	.207	.398	.351	.191	1.923	.214	.474	.372	.102	.784	.305	.766	.287	.986
3511	1.237	.207	.392	.321	.185	1.894	.214	.469	.346	.123	.738	.365	.766	.294	1.244
3512	1.237	.207	.620	.647	.413	2.995	.223	.687	.653	.034	.951	.072	.766	.148	.306
3513	1.237	.207	.802	.843	.595	3.874	.233	.866	.847	.019	.978	.033	.766	.101	.208
3514	1.237	.207	1.014	1.059	.807	4.899	.249	1.077	1.061	.015	.986	.021	.766	.071	.142
3515	2.607	.348	.668	.373	.320	1.920	.385	.754	.456	.298	.605	.529	.741	.279	3.977
3516	2.607	.348	.671	.374	.323	1.928	.381	.757	.457	.300	.604	.531	.741	.277	3.818
3517	2.607	.348	.671	.433	.323	1.928	.358	.757	.495	.262	.654	.471	.741	.277	1.931
3518	2.607	.348	.670	.620	.322	1.925	.355	.756	.650	.106	.860	.202	.741	.277	.918
3519	2.607	.348	.870	.850	.522	2.500	.358	.945	.866	.079	.916	.123	.741	.187	.448
3520	2.607	.348	1.065	1.066	.717	3.060	.364	1.135	1.076	.059	.948	.077	.741	.138	.293
3521	2.607	.348	1.231	1.247	.883	3.537	.370	1.299	1.254	.044	.966	.051	.741	.111	.230
3522	4.520	.517	.975	.366	.458	1.886	.626	1.072	.626	.446	.584	.554	.710	.274	6.463
3523	4.520	.517	.975	.440	.458	1.886	.616	1.072	.620	.452	.578	.560	.710	.274	6.215
3524	4.520	.517	.979	.600	.462	1.894	.531	1.075	.697	.379	.648	.479	.710	.272	2.500
3525	4.520	.517	.984	.620	.467	1.903	.528	1.080	.710	.369	.658	.466	.710	.270	2.232
3526	4.520	.517	1.123	1.047	.606	2.172	.525	1.211	1.079	.132	.891	.159	.710	.222	.582
3527	4.520	.517	1.269	1.224	.752	2.455	.527	1.351	1.247	.103	.923	.113	.710	.185	.441
3528	4.520	.517	1.323	1.289	.806	2.559	.528	1.403	1.310	.093	.934	.098	.710	.173	.411

Table 2. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
41 1	.520	.257	.255	.251	.241	.235	.230	.225	.228	.000	.227	.000	.230	.230
41 2	.520	.266	.265	.262	.253	.251	.244	.241	.242	.000	.241	.000	.243	.243
41 3	.520	.258	.258	.254	.243	.293	.233	.231	.230	.000	.229	.000	.232	.234
41 4	.520	.300	.299	.296	.286	.287	.283	.280	.282	.000	.281	.000	.284	.284
41 5	.520	.585	.586	.585	.582	.583	.579	.579	.578	.000	.578	.000	.580	.582
41 6	.520	.834	.836	.834	.831	.832	.829	.829	.829	.000	.827	.000	.829	.831
41 7	1.140	.361	.360	.354	.338	.328	.312	.308	.305	.000	.323	.000	.321	.323
41 8	1.140	.367	.366	.361	.346	.331	.321	.316	.320	.000	.319	.000	.329	.329
41 9	1.140	.377	.376	.372	.356	.344	.334	.342	.334	.000	.336	.000	.338	.342
4110	1.140	.419	.419	.416	.405	.395	.389	.386	.386	.000	.387	.000	.394	.396
4111	1.140	.666	.667	.666	.660	.660	.655	.654	.655	.000	.655	.000	.658	.660
4112	1.140	.950	.951	.950	.945	.943	.942	.941	.941	.000	.939	.000	.912	.944
4113	2.590	.545	.544	.539	.503	.470	.429	.392	.434	.467	.388	.503	.448	.476
4114	2.590	.553	.548	.539	.514	.480	.433	.409	.450	.460	.417	.513	.461	.495
4115	2.590	.556	.557	.551	.518	.483	.439	.432	.470	.448	.505	.507	.472	.496
4116	2.590	.602	.598	.594	.562	.548	.519	.520	.567	.507	.564	.515	.547	.549
4117	2.590	.848	.847	.844	.830	.804	.814	.816	.812	.812	.820	.815	.820	.829
4118	2.590	1.100	1.101	1.100	1.091	1.084	1.084	1.079	1.083	1.079	1.082	1.081	1.084	1.089
4119	4.280	.730	.728	.722	.680	.653	.566	.469	.397	.400	.531	.558	.482	.501
4120	4.280	.731	.728	.724	.686	.639	.542	.476	.473	.514	.641	.597	.469	.538
4121	4.280	.728	.730	.725	.706	.644	.573	.483	.535	.493	.653	.544	.545	.570
4122	4.280	.756	.754	.747	.711	.673	.610	.549	.555	.666	.600	.602	.669	.651
4123	4.280	.980	.980	.976	.953	.941	.914	.912	.921	.907	.935	.929	.931	.937
4124	4.280	1.252	1.252	1.250	1.232	1.227	1.213	.212	1.210	1.213	1.210	1.212	1.214	1.232

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	F1-E4	E4/E1	1-E15	FN	F1	FB
41 1	.520	.000	.227	.200	.000	.000	.000	.236	.212	.024	.896	.151	.000	.281	.481
41 2	.520	.000	.236	.213	.000	.000	.000	.244	.223	.021	.914	.127	.000	.265	.427
41 3	.520	.000	.228	.204	.000	.000	.000	.237	.215	.022	.908	.135	.000	.279	.466
41 4	.520	.000	.270	.254	.000	.000	.000	.276	.261	.015	.945	.081	.000	.216	.331
41 5	.520	.000	.555	.552	.000	.000	.000	.556	.554	.003	.995	.008	.000	.073	.102
41 6	.520	.000	.804	.801	.000	.000	.000	.805	.802	.003	.996	.006	.000	.042	.058
41 7	1.140	.000	.331	.293	.000	.000	.000	.351	.319	.032	.908	.135	.000	.349	.630
41 8	1.140	.000	.337	.299	.000	.000	.000	.356	.324	.033	.908	.135	.000	.340	.594
41 9	1.140	.000	.347	.312	.000	.000	.000	.365	.335	.031	.916	.123	.000	.325	.542
4110	1.140	.000	.389	.366	.000	.000	.000	.404	.383	.021	.948	.077	.000	.274	.427
4111	1.140	.000	.636	.630	.000	.000	.000	.641	.636	.006	.991	.014	.000	.131	.184
4112	1.140	.000	.920	.914	.000	.000	.000	.923	.917	.006	.994	.010	.000	.075	.110
4113	2.590	.000	.515	.446	.000	.000	.000	.558	.503	.055	.902	.143	.000	.409	.963
4114	2.590	.000	.523	.465	.000	.000	.000	.565	.518	.047	.917	.122	.000	.400	.884
4115	2.590	.000	.526	.466	.000	.000	.000	.567	.519	.049	.914	.126	.000	.396	.809
4116	2.590	.000	.572	.519	.000	.000	.000	.607	.561	.046	.925	.110	.000	.349	.626
4117	2.590	.000	.818	.799	.000	.000	.000	.835	.817	.018	.978	.032	.000	.204	.303
4118	2.590	.000	1.070	1.059	.000	.000	.000	1.080	1.069	.011	.990	.015	.000	.137	.192
4119	4.280	.000	.700	.471	.000	.000	.000	.764	.612	.152	.801	.283	.000	.426	1.533
4120	4.280	.000	.701	.538	.000	.000	.000	.764	.629	.136	.823	.254	.000	.426	1.172
4121	4.280	.000	.698	.540	.000	.000	.000	.762	.647	.115	.849	.218	.000	.428	1.118
4122	4.280	.000	.726	.621	.000	.000	.000	.785	.702	.083	.894	.155	.000	.404	.912
4123	4.280	.000	.950	.937	.000	.000	.000	.985	.945	.040	.960	.060	.000	.270	.415
4124	4.280	.000	1.222	1.202	.000	.000	.000	1.243	1.224	.019	.984	.023	.000	.185	4.390

Table 2. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
42 1	.510	.231	.232	.229	.221	.216	.207	.207	.208	.000	.209	.000	.213	.216
42 2	.510	.237	.238	.237	.218	.224	.219	.216	.217	.000	.217	.000	.222	.226
42 3	.510	.245	.245	.244	.238	.232	.228	.224	.226	.000	.229	.000	.233	.236
42 4	.510	.293	.296	.296	.294	.291	.289	.287	.228	.000	.287	.000	.282	.297
42 5	.510	.579	.582	.583	.582	.583	.580	.581	.581	.000	.581	.000	.584	.589
42 6	.510	.811	.815	.816	.816	.817	.815	.819	.815	.000	.816	.000	.818	.822
42 7	1.130	.342	.342	.339	.325	.312	.295	.291	.287	.000	.300	.000	.300	.307
42 8	1.130	.346	.347	.344	.330	.306	.303	.303	.298	.000	.307	.000	.312	.317
42 9	1.130	.352	.351	.350	.337	.323	.311	.304	.310	.000	.309	.000	.321	.325
4210	1.130	.404	.403	.405	.394	.387	.381	.379	.380	.000	.383	.000	.391	.395
4211	1.130	.679	.680	.681	.678	.676	.674	.675	.675	.000	.675	.000	.680	.684
4212	1.130	.914	.914	.916	.913	.914	.912	.911	.910	.000	.913	.000	.915	.919
4213	2.610	.525	.529	.528	.494	.464	.310	.365	.389	.481	.370	.447	.455	.435
4214	2.610	.532	.534	.530	.509	.460	.421	.374	.406	.431	.377	.486	.460	.450
4215	2.610	.543	.539	.535	.507	.474	.332	.393	.435	.486	.399	.504	.461	.474
4216	2.610	.605	.607	.606	.581	.565	.533	.539	.551	.519	.564	.541	.566	.579
4217	2.610	.814	.820	.822	.808	.799	.785	.794	.797	.798	.802	.800	.804	.810
4218	2.610	1.013	1.017	1.019	1.006	1.003	.998	.998	1.000	.996	1.000	1.002	1.007	1.013
4219	4.130	.708	.707	.705	.667	.629	.564	.459	.435	.361	.493	.622	.525	.537
4220	4.130	.713	.709	.705	.664	.631	.564	.461	.380	.378	.504	.636	.536	.544
4221	4.130	.714	.719	.708	.673	.641	.559	.472	.368	.451	.662	.570	.564	.541
4222	4.130	.742	.745	.733	.716	.639	.598	.543	.567	.673	.600	.612	.671	.647
4223	4.130	1.020	1.023	1.024	1.002	.984	.965	.976	.970	.982	.961	.993	.990	.998
4224	4.130	1.246	1.243	1.250	1.237	1.226	1.209	1.216	1.219	1.221	1.226	1.224	1.226	1.239

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
42 1	.510	.183	.201	.186	.018	1.098	.185	.226	.199	.028	.878	.177	.380	.330	.545
42 2	.510	.183	.207	.196	.024	1.131	.185	.232	.208	.024	.896	.153	.380	.316	.506
42 3	.510	.183	.215	.206	.032	1.175	.185	.239	.216	.023	.906	.138	.380	.299	.475
42 4	.510	.183	.263	.267	.080	1.437	.185	.284	.273	.011	.963	.055	.380	.221	.461
42 5	.510	.183	.549	.559	.366	3.000	.198	.565	.560	.004	.992	.012	.380	.073	.100
42 6	.510	.183	.781	.792	.598	4.268	.214	.796	.793	.003	.996	.006	.380	.043	.059
42 7	1.130	.319	.312	.277	-.007	.978	.321	.349	.305	.043	.876	.181	.366	.378	.691
42 8	1.130	.319	.316	.287	-.003	.991	.321	.352	.313	.039	.890	.161	.366	.371	.649
42 9	1.130	.319	.322	.295	.003	1.009	.321	.357	.320	.037	.895	.153	.366	.361	.627
4210	1.130	.319	.374	.365	.055	1.172	.321	.404	.381	.023	.944	.083	.366	.288	.436
4211	1.130	.319	.649	.654	.330	2.034	.326	.669	.659	.009	.986	.021	.366	.126	.174
4212	1.130	.319	.884	.889	.565	2.771	.332	.901	.892	.009	.990	.016	.366	.079	.109
4213	2.610	.583	.495	.435	-.088	.849	.585	.557	.476	.081	.854	.210	.342	.437	1.403
4214	2.610	.583	.502	.420	-.081	.861	.584	.562	.486	.077	.864	.197	.342	.428	1.030
4215	2.610	.583	.513	.444	-.070	.880	.584	.571	.503	.069	.880	.175	.342	.415	1.252
4216	2.610	.583	.575	.549	-.008	.986	.585	.624	.587	.037	.941	.088	.342	.349	.608
4217	2.610	.583	.784	.780	.201	1.345	.586	.817	.799	.018	.978	.033	.342	.219	.317
4218	2.610	.583	.983	.983	.400	1.686	.588	1.009	.995	.014	.986	.021	.342	.156	.219
4219	4.130	.821	.678	.537	-.143	.826	.823	.756	.620	.136	.821	.257	.324	.432	1.727
4220	4.130	.821	.683	.514	-.138	.832	.823	.760	.624	.136	.821	.256	.324	.427	1.602
4221	4.130	.821	.684	.511	-.137	.833	.823	.760	.622	.138	.818	.260	.324	.426	1.674
4222	4.130	.821	.712	.617	-.109	.867	.822	.784	.693	.090	.885	.168	.324	.401	.895
4223	4.130	.821	.990	.968	.169	1.206	.823	1.034	.999	.035	.966	.050	.324	.245	.366
4224	4.130	.821	1.216	1.209	.395	1.481	.825	1.250	1.229	.021	.983	.025	.324	.180	.257

Table 2. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
43 1	.524	.223	.226	.225	.218	.212	.205	.200	.204	.000	.205	.000	.211	.215
43 2	.524	.226	.228	.231	.228	.220	.214	.211	.214	.000	.213	.000	.220	.225
43 3	.524	.236	.237	.240	.237	.232	.222	.223	.224	.000	.227	.000	.232	.237
43 4	.524	.267	.270	.275	.272	.271	.264	.266	.268	.000	.269	.000	.274	.280
43 5	.524	.524	.529	.532	.531	.532	.529	.531	.532	.000	.532	.000	.537	.544
43 6	.524	.782	.786	.790	.790	.791	.789	.789	.790	.000	.792	.000	.796	.803
43 7	1.130	.328	.331	.330	.316	.303	.282	.284	.278	.000	.279	.000	.301	.306
43 8	1.130	.332	.335	.332	.320	.306	.289	.287	.285	.000	.289	.000	.301	.313
43 9	1.130	.340	.342	.342	.329	.319	.302	.300	.300	.000	.318	.000	.316	.325
4310	1.130	.404	.407	.408	.400	.394	.388	.387	.388	.000	.390	.000	.401	.407
4311	1.130	.687	.692	.694	.692	.695	.692	.690	.691	.000	.693	.000	.697	.704
4312	1.130	.943	.949	.951	.951	.952	.950	.949	.950	.000	.951	.000	.951	.962
4313	2.600	.516	.517	.515	.490	.459	.400	.341	.355	.486	.370	.402	.488	.426
4314	2.600	.520	.519	.519	.488	.455	.409	.354	.382	.486	.356	.437	.448	.435
4315	2.600	.523	.530	.523	.501	.462	.422	.376	.419	.471	.487	.490	.460	.474
4316	2.600	.591	.594	.592	.570	.551	.527	.520	.547	.509	.565	.534	.560	.570
4317	2.600	.868	.873	.875	.867	.859	.889	.855	.858	.800	.861	.863	.866	.877
4318	2.600	1.145	1.151	1.153	1.148	1.147	1.140	1.139	1.143	1.144	1.145	1.148	1.153	1.159
4319	4.240	.703	.711	.710	.667	.637	.562	.457	.370	.346	.459	.608	.533	.557
4320	4.240	.705	.706	.705	.678	.638	.576	.459	.377	.356	.471	.606	.528	.545
4321	4.240	.710	.711	.714	.669	.639	.569	.474	.412	.427	.502	.616	.528	.535
4322	4.240	.751	.757	.756	.721	.691	.631	.681	.618	.600	.616	.652	.702	.676
4323	4.240	1.052	1.053	1.056	1.044	1.019	1.009	1.016	1.001	1.029	1.014	1.031	1.039	1.042
4324	4.240	1.281	1.288	1.285	1.268	1.276	1.257	1.256	1.260	1.261	1.266	1.263	1.275	1.285

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
43 1	.524	.157	.193	.185	.036	1.229	.160	.230	.199	.031	.865	.195	.492	.361	.595
43 2	.524	.157	.196	.195	.039	1.248	.160	.232	.207	.025	.893	.156	.492	.352	.542
43 3	.524	.157	.206	.207	.049	1.312	.160	.241	.218	.023	.904	.140	.492	.327	.496
43 4	.524	.157	.237	.250	.080	1.510	.161	.269	.257	.012	.956	.065	.492	.265	.369
43 5	.524	.157	.494	.514	.337	3.146	.174	.520	.516	.004	.992	.012	.492	.088	.120
43 6	.524	.157	.752	.773	.595	4.790	.196	.777	.774	.003	.996	.006	.492	.047	.064
43 7	1.130	.267	.298	.276	.031	1.116	.269	.346	.305	.042	.879	.176	.478	.405	.729
43 8	1.130	.267	.302	.283	.035	1.131	.269	.350	.310	.040	.887	.165	.478	.397	.699
43 9	1.130	.267	.310	.295	.043	1.161	.270	.357	.320	.037	.897	.150	.478	.382	.641
4310	1.130	.267	.374	.377	.107	1.401	.271	.414	.392	.021	.949	.076	.478	.288	.422
4311	1.130	.267	.657	.674	.390	2.461	.278	.686	.679	.007	.989	.016	.478	.124	.169
4312	1.130	.267	.913	.932	.646	3.419	.287	.940	.935	.005	.995	.008	.478	.076	.103
4313	2.600	.483	.486	.396	.003	1.006	.485	.559	.469	.089	.840	.230	.452	.448	1.194
4314	2.600	.483	.490	.405	.007	1.014	.485	.562	.475	.087	.846	.222	.452	.442	1.123
4315	2.600	.483	.493	.444	.010	1.021	.485	.564	.502	.062	.890	.160	.452	.438	1.017
4316	2.600	.483	.561	.540	.078	1.161	.485	.622	.579	.042	.932	.100	.452	.361	.625
4317	2.600	.483	.838	.847	.355	1.735	.488	.878	.863	.015	.983	.026	.452	.198	.306
4318	2.600	.483	1.115	1.129	.632	2.308	.492	1.148	1.138	.010	.991	.013	.452	.129	.177
4319	4.240	.691	.673	.527	-.018	.974	.694	.765	.637	.127	.833	.239	.431	.448	1.901
4320	4.240	.691	.675	.515	-.016	.977	.694	.766	.630	.136	.823	.254	.431	.446	1.814
4321	4.240	.691	.680	.505	-.011	.984	.693	.770	.625	.145	.812	.269	.431	.441	1.430
4322	4.240	.691	.721	.646	.030	1.043	.693	.804	.719	.085	.895	.154	.431	.404	.785
4323	4.240	.691	1.022	1.012	.331	1.479	.695	1.075	1.042	.033	.969	.046	.431	.239	.353
4324	4.240	.691	1.251	1.255	.560	1.810	.697	1.295	1.274	.020	.984	.023	.431	.177	.249

Table 2. Continued.

CODE	0	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
44 1	.480	.194	.199	.200	.192	.186	.181	.182	.181	.000	.177	.000	.194	.195
44 2	.480	.199	.203	.203	.198	.194	.187	.184	.183	.000	.187	.000	.194	.204
44 3	.480	.205	.213	.213	.210	.204	.197	.195	.200	.000	.201	.000	.208	.215
44 4	.480	.264	.272	.275	.275	.275	.273	.274	.275	.000	.277	.000	.283	.292
44 5	.480	.573	.582	.587	.589	.591	.581	.592	.593	.000	.595	.000	.602	.611
44 6	.480	.877	.885	.887	.893	.896	.906	.896	.898	.000	.900	.000	.906	.915
44 7	1.180	.319	.324	.326	.312	.290	.271	.257	.266	.000	.272	.000	.287	.294
44 8	1.180	.318	.325	.326	.317	.295	.275	.276	.264	.000	.268	.000	.297	.302
44 9	1.180	.322	.328	.333	.321	.303	.285	.287	.283	.000	.281	.000	.312	.314
4410	1.180	.367	.371	.374	.368	.359	.351	.347	.353	.000	.348	.000	.366	.378
4411	1.180	.665	.672	.679	.681	.680	.680	.680	.681	.000	.685	.000	.692	.700
4412	1.180	.966	.974	.979	.982	.982	.980	.982	.988	.000	.986	.000	.992	1.001
4413	2.560	.498	.501	.505	.475	.443	.388	.323	.306	.400	.411	.434	.418	.419
4414	2.560	.498	.502	.506	.478	.445	.394	.330	.334	.446	.381	.367	.431	.420
4415	2.560	.501	.506	.509	.482	.459	.400	.349	.374	.474	.361	.433	.449	.447
4416	2.560	.519	.530	.527	.508	.484	.436	.419	.473	.444	.449	.474	.474	.494
4417	2.560	.858	.868	.856	.856	.861	.854	.857	.853	.859	.862	.869	.873	.881
4418	2.560	1.124	1.134	1.138	1.133	1.136	1.131	1.131	1.135	1.136	1.136	1.143	1.144	1.155
4419	4.340	.708	.709	.713	.678	.647	.559	.468	.369	.330	.418	.587	.542	.586
4420	4.340	.703	.707	.710	.684	.639	.564	.465	.376	.333	.429	.591	.538	.573
4421	4.340	.703	.710	.711	.686	.644	.571	.466	.380	.428	.441	.600	.546	.570
4422	4.340	.725	.729	.729	.703	.671	.598	.537	.507	.669	.621	.667	.644	.687
4423	4.340	1.025	1.033	1.035	1.025	1.007	.987	.990	.984	1.007	.991	1.020	1.016	1.035
4424	4.340	1.289	1.298	1.300	1.298	1.281	1.274	1.279	1.284	1.285	1.288	1.296	1.298	1.310

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
44 1	.480	.126	.164	.165	.038	1.302	.130	.217	.179	.038	.827	.248	.626	.422	.678
44 2	.480	.126	.169	.174	.043	1.341	.130	.221	.187	.034	.845	.223	.626	.403	.639
44 3	.480	.126	.175	.185	.049	1.389	.130	.226	.196	.030	.868	.191	.626	.383	.570
44 4	.480	.126	.234	.262	.108	1.857	.133	.280	.268	.012	.958	.063	.626	.247	.338
44 5	.480	.126	.543	.581	.417	4.310	.158	.583	.582	.000	.999	.001	.626	.070	.096
44 6	.480	.126	.847	.885	.721	6.722	.203	.886	.886	.000	.999	.000	.626	.036	.049
44 7	1.180	.233	.289	.264	.056	1.240	.236	.356	.298	.058	.838	.233	.612	.443	.869
44 8	1.180	.233	.288	.272	.055	1.236	.236	.355	.304	.051	.857	.207	.612	.446	.830
44 9	1.180	.233	.292	.284	.059	1.253	.236	.358	.313	.045	.875	.182	.612	.436	.747
4410	1.180	.233	.337	.348	.104	1.446	.237	.396	.368	.029	.928	.107	.612	.352	.526
4411	1.180	.233	.635	.670	.402	2.725	.246	.679	.675	.004	.994	.009	.612	.136	.186
4412	1.180	.233	.936	.971	.703	4.017	.261	.977	.974	.004	.996	.006	.612	.076	.104
4413	2.560	.403	.468	.389	.065	1.161	.406	.557	.463	.095	.830	.243	.584	.467	1.406
4414	2.560	.403	.468	.390	.065	1.161	.406	.557	.463	.094	.831	.242	.584	.467	1.241
4415	2.560	.403	.471	.417	.068	1.169	.406	.560	.481	.079	.860	.203	.584	.462	1.131
4416	2.560	.403	.489	.464	.086	1.213	.406	.574	.516	.058	.899	.148	.584	.437	.840
4417	2.560	.403	.828	.851	.425	2.055	.411	.883	.866	.016	.982	.028	.584	.198	.273
4418	2.560	.403	1.094	1.125	.691	2.715	.416	1.142	1.134	.008	.993	.010	.584	.131	.178
4419	4.340	.591	.678	.556	.087	1.147	.596	.786	.660	.126	.839	.231	.557	.454	2.103
4420	4.340	.591	.673	.543	.082	1.139	.595	.782	.652	.130	.833	.239	.557	.459	2.072
4421	4.340	.591	.673	.540	.082	1.139	.594	.782	.650	.132	.831	.243	.557	.459	1.669
4422	4.340	.591	.695	.657	.104	1.176	.594	.800	.731	.068	.914	.126	.557	.437	1.049
4423	4.340	.591	.995	1.005	.404	1.684	.596	1.066	1.037	.029	.973	.041	.557	.255	.371
4424	4.340	.591	1.259	1.280	.668	2.130	.599	1.318	1.300	.018	.986	.020	.557	.179	.249

Table 2. Continued.

CODE	0	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
45 1	.490	.173	.177	.183	.178	.168	.172	.174	.178	.000	.179	.000	.172	.180
45 2	.490	.176	.183	.189	.184	.177	.174	.178	.185	.000	.190	.000	.168	.195
45 3	.490	.179	.189	.194	.196	.182	.178	.182	.185	.000	.178	.000	.193	.207
45 4	.490	.212	.222	.228	.228	.226	.224	.222	.225	.000	.229	.000	.238	.251
45 5	.490	.481	.492	.502	.506	.509	.510	.512	.515	.000	.519	.000	.527	.539
45 6	.490	.754	.766	.774	.780	.783	.783	.785	.788	.000	.792	.000	.799	.812
45 7	1.150	.292	.299	.299	.296	.266	.242	.234	.245	.000	.264	.000	.264	.281
45 8	1.150	.289	.296	.301	.291	.269	.244	.233	.250	.000	.269	.000	.260	.284
45 9	1.150	.290	.307	.321	.292	.283	.252	.259	.258	.000	.268	.000	.278	.294
4510	1.150	.312	.324	.331	.318	.305	.294	.290	.296	.000	.309	.000	.314	.334
4511	1.150	.632	.643	.652	.658	.659	.657	.658	.662	.000	.666	.000	.674	.688
4512	1.150	.966	.976	.986	.991	.993	.994	.994	.998	.000	1.001	.000	1.009	1.022
4513	2.480	.470	.478	.483	.462	.431	.374	.305	.257	.305	.410	.333	.338	.422
4514	2.480	.471	.479	.483	.457	.431	.371	.309	.274	.338	.437	.314	.377	.421
4515	2.480	.474	.481	.487	.468	.439	.385	.327	.334	.456	.361	.474	.435	.422
4516	2.480	.494	.505	.510	.493	.470	.426	.414	.460	.439	.438	.510	.469	.494
4517	2.480	.789	.809	.816	.815	.806	.801	.804	.803	.800	.811	.821	.827	.840
4518	2.480	1.090	1.106	1.114	1.115	1.113	1.115	1.114	1.118	1.121	1.124	1.127	1.132	1.148
4519	4.290	.685	.687	.702	.665	.632	.563	.459	.352	.297	.352	.520	.533	.578
4520	4.290	.683	.691	.695	.660	.641	.561	.459	.346	.307	.367	.538	.531	.575
4521	4.290	.685	.693	.699	.658	.638	.552	.453	.358	.314	.387	.564	.526	.582
4522	4.290	.690	.692	.703	.678	.649	.569	.480	.424	.449	.675	.589	.580	.576
4523	4.290	.977	.981	.988	.972	.960	.933	.941	.942	.943	.951	.974	.976	.993
4524	4.290	1.258	1.263	1.276	1.270	1.259	1.253	1.259	1.264	1.269	1.274	1.284	1.282	1.300

Table 2. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
45 1	.490	.110	.143	.150	.033	1.300	.114	.223	.168	.055	.754	.345	.784	.529	.761
45 2	.490	.110	.146	.165	.036	1.327	.114	.225	.180	.045	.799	.285	.784	.513	.761
45 3	.490	.110	.149	.177	.039	1.355	.115	.227	.190	.037	.836	.236	.784	.497	.685
45 4	.490	.110	.182	.221	.072	1.655	.116	.254	.229	.025	.902	.144	.784	.368	.503
45 5	.490	.110	.451	.509	.341	4.100	.139	.513	.511	.002	.995	.007	.784	.094	.129
45 6	.490	.110	.724	.782	.614	6.582	.184	.785	.783	.002	.997	.004	.784	.046	.063
45 7	1.150	.196	.262	.251	.066	1.337	.200	.355	.287	.068	.808	.273	.773	.500	.994
45 8	1.150	.196	.259	.254	.063	1.321	.200	.353	.289	.064	.819	.258	.773	.509	1.001
45 9	1.150	.196	.260	.264	.064	1.327	.200	.353	.296	.057	.839	.232	.773	.506	.876
4510	1.150	.196	.282	.304	.086	1.439	.201	.370	.328	.042	.887	.165	.773	.448	.691
4511	1.150	.196	.602	.658	.406	3.071	.213	.668	.663	.005	.992	.011	.773	.144	.196
4512	1.150	.196	.936	.992	.740	4.776	.235	.999	.994	.004	.996	.006	.773	.074	.101
4513	2.480	.336	.440	.392	.104	1.310	.342	.554	.460	.094	.830	.243	.743	.496	1.826
4514	2.480	.336	.441	.391	.105	1.313	.341	.555	.459	.095	.828	.246	.743	.494	1.639
4515	2.480	.336	.444	.392	.108	1.321	.340	.557	.460	.097	.826	.249	.743	.489	1.220
4516	2.480	.336	.464	.464	.128	1.381	.340	.573	.513	.060	.895	.153	.743	.458	.830
4517	2.480	.336	.759	.810	.423	2.259	.345	.837	.826	.011	.987	.020	.743	.219	.299
4518	2.480	.336	1.060	1.118	.724	3.155	.354	1.129	1.126	.003	.997	.004	.743	.133	.181
4519	4.290	.498	.655	.548	.157	1.315	.506	.788	.652	.136	.828	.247	.712	.472	2.476
4520	4.290	.498	.653	.545	.155	1.311	.505	.786	.650	.136	.827	.248	.712	.474	2.343
4521	4.290	.498	.655	.552	.157	1.315	.505	.788	.655	.133	.831	.243	.712	.472	2.257
4522	4.290	.498	.660	.546	.162	1.325	.502	.792	.651	.141	.822	.255	.712	.467	1.381
4523	4.290	.498	.947	.963	.449	1.902	.505	1.042	.997	.045	.957	.064	.712	.272	.398
4524	4.290	.498	1.228	1.270	.730	2.466	.509	1.309	1.289	.019	.985	.022	.712	.184	.253

NOMENCLATURE

Symbol	Definition
Q	discharge, cfs
6.0	station or point of measurement (in feet) in a downstream direction, includes 8.0, 10.0 cfs
YN	normal flow depth, y_n
Y1	flow depth at station 6.0 corrected by 0.03', y
Y4	flow depth at station 18.0 corrected by 0.03', y_4
Y1-YN	$y_1 - y_n$
Y1/YN	y_1 / y_n
EN	energy for normal flow depth, $y_n + v^2{}_n/2g$
E1	energy at station 6.0, E_1, $(y_1 + v^2{}_1/2g)$
E4	energy at station 18.0, E_4, $(y_4 + v^2{}_4/2g)$
E1-E4	head (energy) loss, $E_1 - E_4$
E4/E1	E_4/E_1, E_r, ratio of energys
1-E15	computation of, $(1 - E_r{}^{1.5})$
FN	Froude number computed at normal flow depth, F_n
F1	Froude number computed at station 6.0
FB	Froude number computed at the minimum flow depth

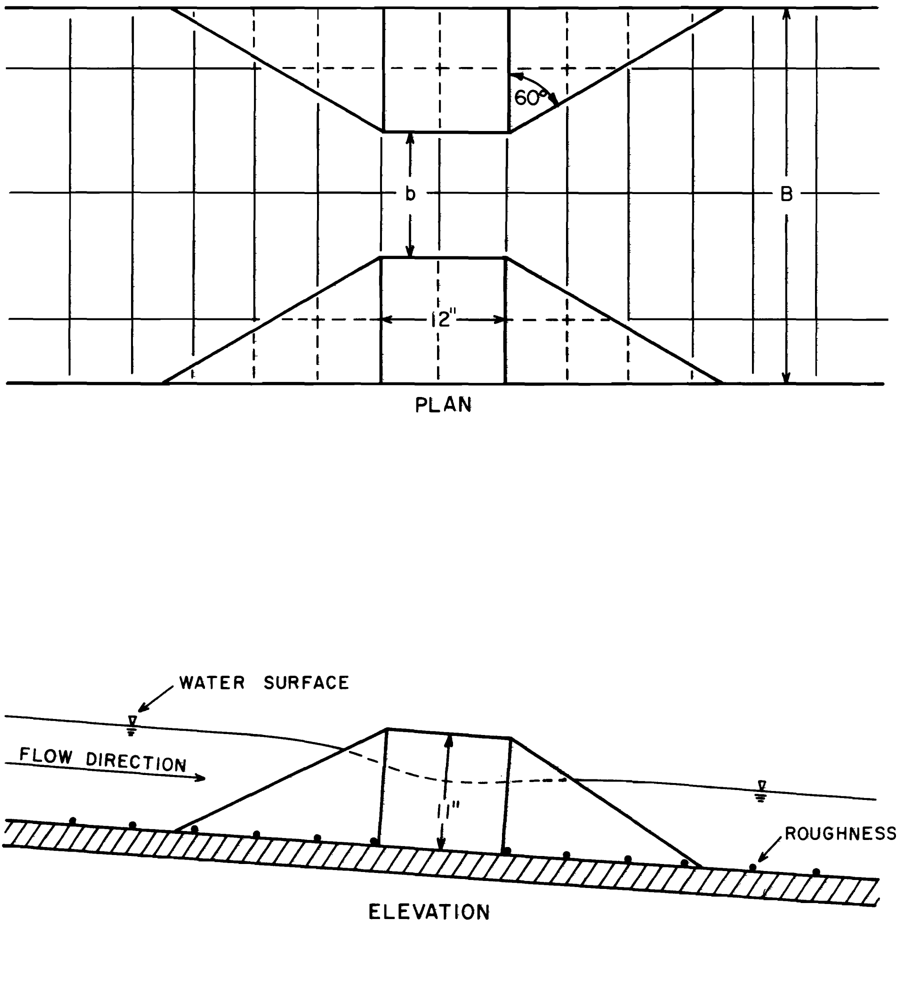


Figure 45. Definition sketch for 60° wingwall constriction with bar roughness shown in tilting flume.

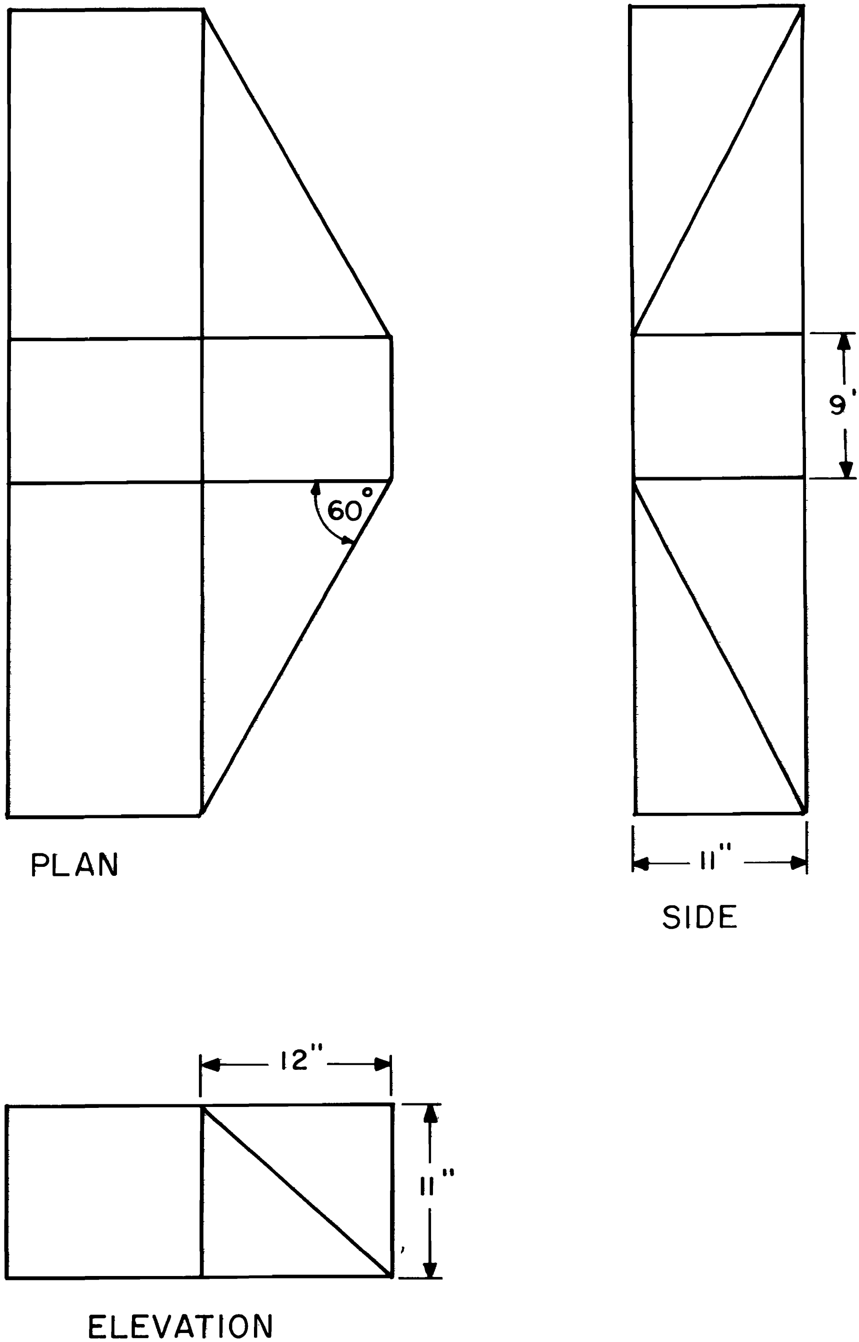


Figure 46. Definition sketch for 60° wingwall constriction.

Table 3. Hydraulic data for tilting flume with 60° wingwall constriction and with slope varying from 0.0000 to 0.0050.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
51 1	.502	.390	.391	.388	.360	.304	.215	.222	.127	.128	.221	.145	.193	.201
51 2	.502	.389	.392	.389	.360	.306	.224	.257	.200	.254	.227	.240	.240	.240
51 3	.502	.399	.401	.400	.373	.326	.287	.278	.322	.283	.313	.311	.319	.316
51 4	.502	.550	.551	.550	.536	.520	.522	.512	.515	.513	.511	.511	.517	.518
51 5	.502	.707	.708	.707	.697	.689	.687	.685	.685	.682	.683	.684	.687	.688
51 6	.502	.826	.828	.827	.820	.824	.811	.810	.810	.808	.809	.811	.810	.813
51 7	.937	.577	.583	.577	.532	.463	.324	.262	.215	.117	.109	.198	.200	.256
51 8	.937	.579	.581	.578	.538	.467	.321	.281	.244	.269	.297	.310	.295	.304
51 9	.337	.583	.583	.582	.543	.472	.441	.344	.372	.360	.384	.382	.383	.386
5110	.937	.685	.685	.684	.653	.607	.621	.599	.590	.607	.585	.601	.600	.607
5111	.937	.766	.767	.765	.753	.706	.693	.699	.707	.707	.704	.704	.708	.710
5112	.937	.873	.874	.873	.856	.834	.834	.832	.832	.829	.827	.826	.831	.853
5113	1.445	.751	.751	.751	.700	.623	.362	.377	.263	.171	.114	.234	.353	.346
5114	1.445	.753	.753	.751	.700	.623	.444	.397	.280	.222	.418	.415	.364	.456
5115	1.445	.754	.754	.753	.704	.724	.442	.364	.327	.452	.459	.425	.468	.507
5116	1.445	.805	.806	.805	.765	.672	.588	.596	.644	.618	.682	.634	.642	.650
5117	1.445	.849	.850	.850	.811	.725	.691	.747	.698	.759	.711	.727	.731	.736
5118	1.445	.897	.894	.893	.866	.784	.812	.780	.800	.804	.794	.778	.795	.796

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
51 1	.502	.000	.360	.171	.000	.000	.000	.363	.186	.178	.511	.635	.000	.136	3.853
51 2	.502	.000	.359	.210	.000	.000	.000	.362	.220	.143	.606	.528	.000	.136	1.661
51 3	.502	.000	.369	.286	.000	.000	.000	.372	.291	.081	.783	.308	.000	.131	.943
51 4	.502	.000	.520	.488	.000	.000	.000	.522	.490	.032	.939	.090	.000	.078	.349
51 5	.502	.000	.677	.658	.000	.000	.000	.678	.659	.019	.972	.042	.000	.053	.221
51 6	.502	.000	.796	.753	.000	.000	.000	.797	.784	.013	.984	.024	.000	.041	.170
51 7	.937	.000	.547	.226	.000	.000	.000	.552	.255	.297	.462	.686	.000	.135	9.785
51 8	.937	.000	.549	.274	.000	.000	.000	.554	.294	.260	.531	.614	.000	.134	2.195
51 9	.937	.000	.553	.356	.000	.000	.000	.558	.368	.190	.659	.465	.000	.133	1.235
5110	.937	.000	.655	.577	.000	.000	.000	.658	.581	.077	.883	.170	.000	.103	.525
5111	.937	.000	.736	.680	.000	.000	.000	.739	.683	.056	.925	.111	.000	.087	.402
5112	.937	.000	.843	.823	.000	.000	.000	.845	.825	.020	.976	.035	.000	.071	.306
5113	1.445	.000	.721	.316	.000	.000	.000	.728	.352	.376	.483	.664	.000	.138	13.763
5114	1.445	.000	.723	.426	.000	.000	.000	.730	.446	.284	.611	.523	.000	.137	3.983
5115	1.445	.000	.724	.477	.000	.000	.000	.731	.493	.238	.674	.447	.000	.137	2.070
5116	1.445	.000	.775	.620	.000	.000	.000	.781	.629	.152	.805	.277	.000	.124	.804
5117	1.445	.000	.819	.736	.000	.000	.000	.824	.713	.111	.865	.195	.000	.114	.623
5118	1.445	.000	.867	.766	.000	.000	.000	.872	.772	.100	.886	.167	.000	.104	.518

Table 3. Continued.

CODE	0	5.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
52 1	.460	.361	.368	.364	.666	.287	.203	.222	.114	.107	.197	.146	.175	.200
52 2	.460	.361	.368	.364	.337	.286	.206	.217	.146	.263	.162	.222	.194	.233
52 3	.460	.363	.365	.363	.341	.291	.230	.270	.254	.279	.268	.267	.273	.276
52 4	.460	.521	.524	.526	.515	.503	.469	.499	.497	.500	.497	.498	.502	.507
52 5	.460	.699	.702	.703	.697	.691	.690	.689	.689	.689	.689	.690	.692	.697
52 6	.460	.845	.849	.851	.846	.841	.842	.842	.842	.839	.841	.842	.844	.849
52 7	.747	.489	.496	.493	.458	.394	.273	.217	.179	.097	.131	.229	.197	.238
52 8	.747	.489	.493	.492	.457	.393	.271	.237	.178	.141	.291	.212	.232	.236
52 9	.747	.491	.494	.495	.461	.398	.287	.291	.272	.269	.324	.291	.312	.314
5210	.747	.619	.623	.624	.607	.573	.550	.562	.578	.577	.571	.571	.573	.585
5211	.747	.759	.662	.763	.753	.732	.733	.731	.732	.729	.729	.729	.732	.742
5212	.747	.869	.872	.873	.863	.854	.851	.849	.846	.847	.851	.851	.852	.857
5213	1.144	.646	.649	.651	.607	.532	.371	.297	.233	.141	.199	.229	.235	.288
5214	1.144	.647	.651	.651	.608	.535	.375	.299	.247	.160	.246	.439	.284	.356
5215	1.144	.654	.657	.668	.615	.543	.492	.467	.389	.411	.414	.414	.430	.420
5216	1.144	.711	.714	.714	.680	.621	.552	.609	.577	.629	.572	.627	.604	.619
5217	1.144	.810	.814	.814	.790	.739	.575	.739	.735	.744	.737	.740	.742	.752
5218	1.144	.885	.888	.889	.868	.822	.826	.829	.832	.827	.829	.833	.833	.842
5219	1.579	.787	.790	.790	.745	.628	.496	.359	.287	.174	.115	.112	.392	.362
5220	1.579	.787	.789	.794	.744	.629	.477	.357	.288	.287	.367	.431	.342	.419
5221	1.579	.789	.791	.791	.742	.639	.496	.371	.315	.391	.472	.428	.394	.500
5222	1.579	.826	.829	.830	.791	.690	.590	.629	.666	.600	.647	.654	.628	.642
5223	1.579	.863	.866	.866	.833	.732	.747	.796	.700	.710	.729	.702	.720	.738
5224	1.579	.891	.895	.895	.865	.767	.754	.784	.757	.780	.767	.774	.767	.791

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	F4	E1-E4	E4/F1	1-E15	FN	F1	FB
52 1	.460	.171	.331	.170	.160	1.936	.234	.349	.182	.166	.523	.621	.380	.141	4.992
52 2	.460	.171	.331	.203	.160	1.936	.188	.349	.212	.137	.607	.527	.380	.141	2.700
52 3	.460	.171	.333	.246	.162	1.947	.178	.351	.252	.099	.719	.391	.380	.140	1.193
52 4	.460	.171	.491	.477	.320	2.871	.184	.507	.479	.028	.944	.083	.380	.078	.367
52 5	.460	.171	.669	.567	.498	3.912	.197	.684	.668	.016	.975	.036	.380	.049	.199
52 6	.460	.171	.815	.819	.644	4.766	.210	.830	.820	.010	.987	.019	.380	.036	.147
52 7	.747	.239	.459	.208	.220	1.921	.585	.478	.230	.248	.481	.666	.373	.140	9.988
52 8	.747	.239	.459	.206	.220	1.921	.292	.478	.228	.250	.478	.670	.373	.140	4.684
52 9	.747	.239	.461	.284	.222	1.929	.246	.480	.296	.184	.616	.516	.373	.139	1.482
5210	.747	.239	.589	.555	.350	2.464	.249	.606	.558	.048	.921	.117	.373	.096	.449
5211	.747	.239	.729	.712	.490	3.050	.252	.745	.714	.031	.959	.062	.373	.070	.345
5212	.747	.239	.838	.827	.599	3.506	.260	.854	.828	.025	.970	.044	.373	.057	.235
5213	1.144	.322	.616	.258	.294	1.913	.467	.636	.291	.345	.458	.690	.365	.138	7.173
5214	1.144	.322	.617	.326	.295	1.916	.402	.637	.347	.290	.544	.598	.365	.138	5.659
5215	1.144	.322	.624	.390	.302	1.938	.329	.644	.405	.239	.628	.502	.365	.135	1.233
5216	1.144	.322	.681	.589	.359	2.115	.329	.700	.595	.105	.857	.216	.365	.119	.703
5217	1.144	.322	.780	.722	.458	2.422	.329	.798	.726	.072	.917	.132	.365	.097	.659
5218	1.144	.322	.855	.812	.533	2.655	.334	.872	.815	.057	.935	.096	.365	.084	.376
5219	1.579	.405	.757	.332	.352	1.869	1.453	.779	.371	.409	.475	.672	.357	.140	15.593
5220	1.579	.405	.757	.389	.352	1.869	.422	.779	.417	.362	.535	.608	.357	.140	2.810
5221	1.579	.405	.758	.470	.353	1.872	.418	.780	.489	.291	.627	.503	.357	.140	2.406
5222	1.579	.405	.796	.612	.391	1.965	.411	.817	.623	.194	.763	.334	.357	.130	.874
5223	1.579	.405	.833	.708	.428	2.057	.412	.854	.716	.137	.839	.231	.357	.121	.668
5224	1.579	.405	.861	.761	.456	2.126	.413	.881	.768	.113	.872	.186	.357	.115	.594

Table 3. Continued.

CODE	0	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
53 1	.410	.332	.337	.338	.319	.264	.191	.206	.103	.104	.162	.158	.153	.187
53 2	.410	.334	.338	.340	.316	.270	.202	.241	.202	.245	.222	.227	.238	.237
53 3	.410	.351	.359	.360	.339	.305	.316	.241	.282	.301	.291	.286	.296	.307
53 4	.410	.521	.526	.523	.520	.512	.514	.519	.512	.510	.512	.511	.516	.522
53 5	.410	.700	.705	.704	.703	.698	.700	.699	.700	.699	.699	.702	.704	.710
53 6	.410	.808	.814	.816	.816	.811	.811	.810	.811	.810	.811	.812	.815	.820
53 7	.782	.505	.508	.511	.478	.412	.288	.246	.187	.142	.182	.254	.188	.250
53 8	.782	.506	.508	.512	.476	.412	.315	.254	.197	.160	.297	.226	.253	.250
53 9	.782	.508	.516	.514	.480	.416	.292	.315	.316	.331	.344	.327	.338	.347
5310	.782	.654	.660	.662	.646	.611	.602	.603	.612	.620	.614	.614	.617	.627
5311	.782	.761	.767	.769	.757	.748	.741	.735	.739	.738	.738	.740	.742	.750
5312	.782	.872	.876	.880	.871	.859	.859	.851	.858	.856	.857	.857	.860	.872
5313	1.140	.640	.644	.647	.606	.534	.374	.297	.239	.139	.096	.159	.220	.280
5314	1.140	.640	.644	.646	.606	.533	.370	.299	.240	.244	.149	.330	.254	.340
5315	1.140	.679	.647	.646	.508	.574	.374	.304	.255	.230	.414	.322	.340	.345
5316	1.140	.733	.737	.741	.711	.658	.658	.628	.663	.622	.652	.637	.658	.664
5317	1.140	.818	.823	.827	.804	.760	.775	.764	.756	.762	.763	.759	.765	.774
5318	1.140	.895	.899	.899	.887	.874	.848	.841	.842	.851	.852	.850	.854	.861
5319	1.580	.776	.783	.785	.741	.637	.499	.363	.283	.177	.117	.104	.367	.342
5320	1.580	.779	.784	.785	.738	.627	.497	.358	.279	.177	.147	.399	.334	.413
5321	1.580	.781	.785	.787	.741	.629	.502	.365	.309	.322	.459	.448	.400	.471
5322	1.580	.832	.837	.840	.802	.696	.607	.697	.697	.636	.666	.684	.667	.694
5323	1.580	.855	.860	.860	.827	.725	.651	.789	.792	.720	.730	.714	.728	.729
5324	1.580	.886	.889	.893	.861	.761	.744	.771	.739	.781	.761	.772	.768	.787

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
53 1	.410	.133	.302	.157	.169	2.271	.215	.329	.169	.161	.512	.633	.493	.144	4.820
53 2	.410	.133	.304	.207	.171	2.286	.143	.331	.214	.117	.645	.482	.493	.143	1.333
53 3	.410	.133	.321	.277	.188	2.414	.143	.348	.281	.067	.807	.275	.493	.132	.752
53 4	.410	.133	.491	.492	.358	3.692	.157	.516	.493	.023	.955	.066	.493	.070	.287
53 5	.410	.133	.670	.680	.537	5.038	.177	.695	.681	.014	.980	.030	.493	.044	.174
53 6	.410	.133	.778	.790	.645	5.850	.192	.802	.790	.012	.985	.022	.493	.035	.139
53 7	.782	.207	.475	.220	.268	2.295	.287	.504	.242	.262	.480	.668	.485	.139	4.838
53 8	.782	.207	.476	.220	.269	2.300	.255	.505	.242	.263	.479	.669	.485	.139	3.869
53 9	.782	.207	.478	.317	.271	2.309	.217	.507	.327	.179	.646	.480	.485	.138	1.352
5310	.782	.207	.624	.597	.417	3.014	.222	.651	.600	.051	.922	.115	.485	.093	.419
5311	.782	.207	.731	.720	.524	3.531	.229	.757	.722	.035	.954	.068	.485	.073	.306
5312	.782	.207	.842	.842	.635	4.068	.235	.867	.843	.024	.972	.041	.485	.059	.244
5313	1.140	.269	.610	.250	.341	2.268	1.808	.640	.285	.355	.446	.702	.477	.140	15.590
5314	1.140	.269	.610	.310	.341	2.268	.426	.640	.333	.307	.520	.625	.477	.140	6.439
5315	1.140	.269	.609	.315	.340	2.264	.296	.639	.337	.302	.528	.616	.477	.140	2.955
5316	1.140	.269	.703	.634	.434	2.613	.280	.731	.640	.092	.874	.183	.477	.113	.580
5317	1.140	.269	.788	.744	.519	2.929	.284	.816	.748	.068	.917	.122	.477	.095	.427
5318	1.140	.269	.865	.831	.596	3.216	.287	.892	.834	.058	.935	.096	.477	.083	.362
5319	1.580	.338	.746	.312	.408	2.207	2.604	.778	.356	.422	.457	.691	.469	.143	18.200
5320	1.580	.338	.749	.383	.411	2.216	.714	.781	.412	.369	.528	.617	.469	.142	9.155
5321	1.580	.338	.751	.441	.413	2.222	.357	.783	.463	.320	.591	.545	.469	.142	2.486
5322	1.580	.338	.802	.664	.464	2.373	.347	.833	.674	.159	.809	.272	.469	.128	.836
5323	1.580	.338	.825	.699	.487	2.441	.347	.855	.708	.148	.827	.247	.469	.123	.749
5324	1.580	.338	.856	.757	.518	2.533	.349	.886	.764	.121	.863	.198	.469	.116	.614

Table 3. Continued.

CODE	0	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
54 1	.410	.321	.329	.330	.313	.264	.190	.200	.100	.071	.164	.148	.143	.177
54 2	.410	.320	.329	.332	.313	.264	.195	.226	.168	.221	.188	.219	.218	.226
54 3	.410	.338	.346	.351	.332	.297	.309	.271	.274	.298	.277	.282	.293	.303
54 4	.410	.535	.542	.548	.543	.537	.535	.535	.535	.547	.540	.541	.544	.555
54 5	.410	.703	.711	.717	.717	.713	.712	.712	.713	.714	.717	.720	.721	.730
54 6	.410	.803	.811	.816	.818	.814	.814	.815	.817	.817	.819	.821	.823	.831
54 7	.782	.493	.501	.506	.476	.409	.379	.243	.189	.099	.077	.135	.171	.243
54 8	.782	.492	.502	.507	.476	.411	.385	.249	.195	.238	.296	.241	.250	.255
54 9	.782	.495	.501	.508	.478	.413	.290	.272	.290	.280	.327	.311	.319	.327
5410	.782	.620	.629	.633	.617	.579	.575	.581	.594	.583	.587	.588	.589	.604
5411	.782	.765	.772	.777	.768	.749	.751	.749	.751	.753	.753	.756	.757	.768
5412	.782	.848	.856	.861	.856	.844	.841	.840	.843	.845	.845	.848	.879	.859
5413	1.135	.629	.637	.641	.603	.531	.367	.291	.238	.138	.092	.190	.272	.287
5414	1.135	.629	.635	.641	.603	.527	.368	.297	.238	.144	.237	.329	.261	.338
5415	1.135	.631	.640	.644	.606	.630	.380	.330	.322	.341	.357	.359	.373	.384
5416	1.135	.728	.735	.739	.613	.659	.684	.630	.673	.634	.667	.649	.660	.669
5417	1.135	.803	.816	.818	.796	.748	.760	.761	.751	.754	.752	.735	.760	.772
5418	1.135	.847	.885	.885	.870	.827	.831	.828	.839	.839	.844	.847	.847	.855
5419	1.563	.765	.773	.777	.736	.625	.483	.351	.275	.174	.117	.091	.346	.334
5420	1.563	.766	.772	.777	.733	.623	.492	.356	.278	.177	.130	.314	.359	.397
5421	1.563	.769	.773	.779	.736	.620	.586	.356	.288	.349	.536	.622	.360	.469
5422	1.563	.814	.823	.826	.793	.687	.599	.670	.775	.624	.656	.672	.657	.681
5423	1.563	.848	.856	.859	.830	.731	.668	.788	.695	.728	.731	.710	.747	.761
5424	1.563	.886	.893	.898	.871	.777	.768	.787	.771	.801	.781	.787	.796	.722

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
54 1	.410	.117	.291	.147	.176	2.575	1.106	.333	.160	.173	.482	.666	.630	.152	11.452
54 2	.410	.113	.290	.196	.177	2.566	.132	.332	.203	.128	.613	.520	.630	.153	1.854
54 3	.410	.113	.306	.273	.195	2.726	.127	.349	.277	.073	.792	.295	.630	.140	.804
54 4	.410	.113	.505	.525	.392	4.469	.149	.545	.526	.019	.965	.050	.630	.067	.265
54 5	.410	.113	.673	.700	.560	5.956	.175	.712	.701	.011	.984	.024	.630	.043	.172
54 6	.410	.113	.773	.801	.660	6.841	.194	.812	.801	.010	.987	.019	.630	.035	.140
54 7	.782	.176	.463	.213	.287	2.631	3.259	.506	.236	.270	.466	.682	.618	.145	17.796
54 8	.782	.176	.462	.225	.286	2.625	.208	.505	.246	.260	.486	.661	.618	.145	2.705
54 9	.782	.176	.465	.297	.289	2.642	.191	.508	.309	.199	.608	.526	.618	.144	1.523
5410	.782	.176	.590	.574	.414	3.352	.196	.631	.577	.054	.914	.126	.618	.101	.451
5411	.782	.176	.735	.738	.559	4.176	.207	.775	.740	.035	.954	.068	.618	.072	.297
5412	.782	.176	.818	.829	.642	4.648	.214	.858	.831	.027	.968	.048	.618	.062	.249
5413	1.135	.227	.599	.257	.372	2.639	2.946	.644	.290	.353	.451	.697	.612	.143	17.048
5414	1.135	.227	.599	.308	.372	2.639	.432	.644	.331	.312	.515	.631	.612	.143	6.837
5415	1.135	.227	.601	.354	.374	2.648	.243	.645	.372	.274	.575	.563	.612	.142	1.668
5416	1.135	.227	.698	.639	.471	3.075	.242	.741	.644	.097	.870	.189	.612	.114	.591
5417	1.135	.227	.773	.742	.546	3.405	.247	.915	.746	.169	.815	.124	.612	.097	.445
5418	1.135	.227	.817	.925	.590	3.599	.251	.954	.829	.130	.865	.053	.612	.090	.370
5419	1.563	.284	.735	.304	.451	2.588	6.[illegible]	.761	.349	.472	.447	.701	.603	.145	24.056
5420	1.563	.284	.736	.357	.452	2.592	1.272	.782	.308	.474	.609	.637	.603	.144	11.461
5421	1.563	.284	.739	.429	.455	2.602	.317	.785	.461	.324	.587	.551	.603	.144	2.766
5422	1.563	.284	.734	[illegible]	.500	2.761	.297	.829	.661	.168	.797	.289	.603	.131	.844
5423	1.563	.284	.818	.731	.534	2.832	.297	.903	.779	.124	.855	.207	.603	.123	.711
5424	1.563	.284	.856	.652	.572	3.014	.299	.900	.701	.199	.778	.313	.603	.115	.630

Table 3. Continued.

CODE	0	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
55 1	.351	.277	.289	.301	.281	.238	.172	.188	.085	.059	.143	.142	.141	.160
55 2	.351	.276	.289	.296	.279	.237	.174	.186	.098	.171	.131	.162	.164	.189
55 3	.351	.279	.289	.237	.281	.238	.186	.211	.148	.212	.202	.209	.261	.228
55 4	.351	.500	.511	.520	.520	.513	.517	.517	.521	.520	.523	.527	.531	.543
55 5	.351	.688	.699	.709	.713	.713	.712	.714	.717	.717	.720	.724	.728	.740
55 6	.351	.807	.818	.826	.831	.837	.834	.837	.835	.838	.841	.845	.845	.859
55 7	.765	.473	.483	.491	.463	.401	.274	.236	.180	.094	.069	.189	.159	.226
55 8	.765	.473	.484	.491	.463	.397	.275	.234	.188	.105	.191	.238	.205	.249
55 9	.765	.476	.486	.492	.463	.404	.284	.276	.272	.266	.294	.297	.305	.325
5510	.765	.635	.645	.646	.643	.614	.612	.613	.618	.619	.624	.630	.634	.647
5511	.765	.766	.775	.783	.780	.767	.765	.767	.770	.771	.771	.775	.778	.794
5512	.765	.838	.861	.869	.870	.858	.854	.859	.860	.861	.862	.868	.869	.885
5513	1.135	.625	.635	.645	.610	.536	.370	.289	.234	.141	.091	.086	.307	.274
5514	1.135	.624	.635	.644	.610	.539	.371	.294	.236	.245	.104	.221	.250	.322
5515	1.135	.623	.635	.644	.605	.533	.374	.299	.252	.251	.399	.357	.321	.381
5516	1.135	.735	.746	.754	.733	.678	.698	.657	.694	.657	.691	.685	.689	.697
5517	1.135	.832	.843	.852	.838	.794	.799	.806	.798	.799	.809	.811	.813	.829
5518	1.135	.878	.887	.895	.889	.840	.846	.845	.859	.864	.879	.864	.866	.883
5519	1.580	.753	.765	.773	.734	.624	.484	.354	.279	.174	.118	.092	.308	.318
5520	1.580	.753	.764	.773	.733	.625	.485	.349	.277	.177	.115	.231	.403	.380
5521	1.580	.755	.763	.773	.733	.627	.486	.357	.272	.199	.309	.486	.368	.469
5522	1.580	.819	.827	.841	.809	.707	.731	.756	.693	.667	.739	.698	.706	.729
5523	1.580	.842	.855	.861	.836	.740	.676	.781	.718	.761	.741	.761	.766	.794
5524	1.580	.866	.878	.887	.864	.768	.764	.784	.767	.787	.782	.791	.795	.818

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	F1-E4	E4/E1	1-E15	FN	F1	FB
55 1	.351	.087	.247	.130	.160	2.839	3.627	.310	.142	.168	.459	.689	.798	.167	16.480
55 2	.351	.087	.246	.159	.159	2.828	.225	.309	.167	.142	.541	.603	.798	.168	4.590
55 3	.351	.087	.248	.198	.161	2.851	.115	.311	.203	.108	.653	.472	.798	.166	2.008
55 4	.351	.087	.470	.513	.383	5.402	.140	.531	.514	.017	.968	.048	.798	.064	.253
55 5	.351	.087	.658	.710	.571	7.563	.187	.718	.710	.008	.989	.017	.798	.038	.152
55 6	.351	.087	.777	.829	.690	8.931	.225	.837	.829	.008	.990	.014	.798	.030	.119
55 7	.765	.148	.443	.196	.295	2.993	8.527	.508	.222	.286	.437	.711	.784	.151	23.032
55 8	.765	.148	.443	.219	.295	2.993	.789	.508	.240	.268	.472	.676	.784	.151	8.636
55 9	.765	.148	.446	.295	.298	3.014	.169	.511	.306	.205	.600	.536	.784	.150	1.547
5510	.765	.148	.605	.617	.457	4.088	.179	.668	.620	.048	.928	.106	.784	.095	.400
5511	.765	.148	.736	.764	.588	4.973	.193	.798	.766	.032	.960	.060	.784	.071	.282
5512	.765	.148	.808	.855	.660	5.459	.202	.870	.856	.013	.985	.023	.784	.061	.244
5513	1.135	.195	.595	.244	.400	3.051	5.711	.661	.281	.380	.425	.723	.769	.144	19.860
5514	1.135	.195	.594	.292	.399	3.046	2.028	.660	.318	.342	.481	.666	.769	.145	13.074
5515	1.135	.195	.593	.351	.398	3.041	.234	.659	.369	.290	.559	.582	.769	.145	2.533
5516	1.135	.195	.705	.667	.510	3.615	.218	.769	.672	.097	.873	.184	.769	.112	.530
5517	1.135	.195	.802	.799	.607	4.113	.225	.865	.802	.063	.927	.107	.769	.092	.394
5518	1.135	.195	.848	.853	.653	4.349	.228	.911	.856	.055	.940	.089	.769	.085	.361
5519	1.580	.245	.723	.288	.478	2.951	8.952	.791	.339	.452	.429	.719	.760	.150	23.732
5520	1.580	.245	.723	.350	.478	2.951	2.737	.791	.385	.406	.486	.661	.760	.150	14.784
5521	1.580	.245	.725	.439	.480	2.959	.425	.793	.461	.332	.581	.557	.760	.149	5.273
5522	1.580	.245	.789	.693	.544	3.220	.263	.856	.708	.148	.827	.248	.760	.132	.721
5523	1.580	.245	.812	.764	.567	3.314	.263	.878	.771	.107	.878	.177	.760	.126	.706
5524	1.580	.245	.836	.788	.591	3.412	.266	.902	.795	.107	.881	.173	.760	.121	.583

Table 3. Continued.

CODE	Q	5.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
61 1	.500	.268	.267	.265	.241	.226	.221	.216	.205	.192	.200	.206	.215	.223
61 2	.500	.274	.274	.272	.246	.237	.231	.231	.228	.234	.225	.218	.237	.236
61 3	.500	.282	.281	.279	.257	.247	.239	.239	.240	.235	.240	.242	.240	.248
61 4	.500	.464	.455	.463	.452	.450	.449	.447	.447	.444	.445	.445	.451	.455
61 5	.500	.627	.625	.628	.517	.619	.617	.613	.615	.613	.612	.612	.620	.622
61 6	.500	.810	.811	.810	.801	.802	.800	.798	.800	.797	.797	.797	.803	.806
61 7	.920	.364	.364	.360	.320	.281	.246	.238	.253	.233	.247	.291	.266	.280
61 8	.920	.366	.367	.363	.323	.296	.257	.271	.238	.271	.242	.269	.268	.286
61 9	.920	.372	.371	.367	.332	.304	.275	.287	.258	.295	.271	.283	.292	.291
6110	.920	.555	.556	.555	.538	.535	.529	.523	.537	.525	.524	.525	.532	.537
6111	.920	.717	.722	.717	.705	.700	.698	.698	.697	.695	.696	.698	.703	.707
6112	.920	.866	.868	.867	.856	.857	.852	.850	.849	.849	.849	.849	.854	.859
6113	1.440	.479	.476	.473	.426	.230	.309	.250	.242	.298	.297	.297	.327	.349
6114	1.440	.479	.478	.473	.425	.382	.312	.256	.265	.319	.294	.319	.334	.351
6115	1.440	.482	.481	.478	.432	.390	.323	.304	.354	.300	.315	.347	.339	.356
6116	1.440	.602	.602	.602	.573	.556	.563	.541	.541	.542	.549	.544	.553	.559
6117	1.440	.727	.726	.726	.704	.697	.692	.687	.691	.687	.690	.689	.698	.702
6118	1.440	.855	.856	.855	.837	.833	.831	.829	.835	.825	.825	.827	.834	.837
6119	2.080	.599	.602	.595	.536	.485	.400	.301	.254	.257	.340	.391	.331	.429
6120	2.080	.599	.602	.594	.539	.487	.400	.304	.258	.281	.378	.390	.348	.444
6121	2.080	.601	.601	.597	.543	.490	.409	.331	.329	.395	.381	.395	.387	.407
6122	2.080	.696	.699	.695	.554	.629	.612	.611	.618	.608	.604	.620	.620	.632
6123	2.080	.794	.794	.791	.758	.741	.739	.729	.727	.737	.733	.733	.745	.751
6124	2.080	.860	.862	.858	.830	.816	.812	.813	.804	.806	.812	.812	.818	.809

Table 3. Continued.

CODE	D	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
61 1	.500	.000	.238	.193	.000	.000	.000	.246	.204	.041	.833	.240	.000	.251	.892
61 2	.500	.000	.244	.206	.000	.000	.000	.251	.216	.035	.860	.202	.000	.242	.713
61 3	.500	.000	.252	.218	.000	.000	.000	.259	.227	.032	.877	.178	.000	.231	.627
61 4	.500	.000	.434	.425	.000	.000	.000	.436	.427	.009	.980	.030	.000	.102	.218
61 5	.500	.000	.597	.592	.000	.000	.000	.598	.593	.005	.992	.012	.000	.063	.131
61 6	.500	.000	.780	.776	.000	.000	.000	.781	.777	.004	.995	.008	.000	.042	.087
61 7	.920	.000	.334	.250	.000	.000	.000	.347	.273	.074	.787	.302	.000	.278	1.170
61 8	.920	.000	.336	.256	.000	.000	.000	.349	.278	.071	.797	.288	.000	.276	1.128
61 9	.920	.000	.342	.261	.000	.000	.000	.354	.282	.072	.796	.289	.000	.268	.983
6110	.920	.000	.526	.507	.000	.000	.000	.531	.513	.019	.965	.052	.000	.141	.309
6111	.920	.000	.687	.677	.000	.000	.000	.690	.680	.010	.986	.021	.000	.094	.197
6112	.920	.000	.836	.823	.000	.000	.000	.838	.831	.007	.992	.012	.000	.070	.144
6113	1.440	.000	.448	.319	.000	.000	.000	.466	.354	.112	.760	.338	.000	.280	1.716
6114	1.440	.000	.448	.321	.000	.000	.000	.466	.355	.110	.763	.333	.000	.280	1.559
6115	1.440	.000	.452	.326	.000	.000	.000	.469	.359	.110	.765	.330	.000	.277	1.194
6116	1.440	.000	.572	.523	.000	.000	.000	.583	.542	.041	.929	.104	.000	.194	.459
6117	1.440	.000	.697	.672	.000	.000	.000	.704	.680	.024	.965	.052	.000	.144	.315
6118	1.440	.000	.825	.807	.000	.000	.000	.830	.812	.018	.979	.032	.000	.112	.236
6119	2.080	.000	.569	.399	.000	.000	.000	.592	.445	.146	.752	.347	.000	.283	2.282
6120	2.080	.000	.569	.414	.000	.000	.000	.592	.457	.135	.772	.321	.000	.283	2.222
6121	2.080	.000	.571	.377	.000	.000	.000	.594	.429	.165	.722	.386	.000	.281	1.480
6122	2.080	.000	.666	.602	.000	.000	.000	.683	.622	.060	.912	.129	.000	.223	.556
6123	2.080	.000	.764	.721	.000	.000	.000	.777	.735	.041	.947	.079	.000	.182	.416
6124	2.080	.000	.830	.779	.000	.000	.000	.841	.791	.050	.941	.087	.000	.161	.355

Table 3. Continued.

CODE	0	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
62 1	.520	.261	.261	.260	.236	.224	.216	.197	.197	.212	.213	.198	.218	.225
62 2	.520	.269	.270	.263	.245	.235	.231	.223	.211	.206	.215	.218	.228	.237
62 3	.520	.280	.283	.261	.261	.247	.246	.244	.250	.246	.239	.251	.252	.259
62 4	.520	.423	.436	.496	.489	.428	.486	.485	.463	.493	.484	.485	.491	.497
62 5	.520	.684	.687	.683	.681	.682	.681	.679	.680	.679	.679	.682	.687	.691
62 6	.520	.855	.859	.853	.854	.854	.853	.852	.853	.852	.853	.854	.863	.864
62 7	.870	.340	.342	.338	.305	.276	.233	.237	.221	.240	.242	.244	.246	.262
62 8	.870	.340	.343	.340	.308	.279	.243	.256	.222	.263	.235	.261	.257	.265
62 9	.870	.351	.354	.355	.322	.299	.279	.277	.358	.257	.289	.251	.286	.290
6210	.870	.522	.526	.523	.508	.513	.501	.500	.500	.500	.500	.501	.511	.516
6211	.870	.702	.704	.705	.695	.695	.691	.691	.692	.689	.692	.691	.698	.704
6212	.870	.862	.866	.867	.860	.859	.857	.855	.856	.863	.856	.859	.863	.867
6213	1.490	.477	.478	.477	.431	.384	.314	.247	.220	.254	.309	.295	.318	.320
6214	1.480	.477	.479	.478	.437	.395	.314	.252	.250	.312	.308	.299	.337	.352
6215	1.480	.477	.480	.462	.436	.392	.329	.303	.358	.327	.341	.356	.350	.369
6216	1.480	.618	.621	.620	.592	.582	.581	.574	.572	.569	.573	.578	.585	.596
6217	1.480	.749	.755	.756	.738	.727	.727	.723	.727	.723	.726	.729	.736	.741
6218	1.480	.872	.876	.877	.862	.857	.857	.856	.853	.854	.854	.857	.863	.868
6219	1.990	.575	.578	.576	.523	.472	.387	.290	.241	.234	.295	.373	.310	.421
6220	1.990	.576	.577	.577	.523	.471	.387	.299	.257	.289	.380	.377	.347	.437
6221	1.990	.589	.588	.583	.530	.481	.409	.259	.413	.455	.354	.404	.421	.443
6222	1.990	.673	.676	.677	.638	.612	.600	.588	.607	.593	.602	.597	.618	.624
6223	1.990	.770	.772	.772	.740	.729	.727	.709	.714	.722	.722	.722	.729	.742
6224	1.990	.884	.888	.887	.862	.855	.859	.845	.862	.851	.851	.854	.858	.866

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
62 1	.520	.186	.231	.195	.045	1.242	.189	.254	.207	.047	.815	.264	.378	.273	.886
62 2	.520	.186	.239	.207	.053	1.285	.189	.261	.218	.044	.833	.240	.378	.260	.819
62 3	.520	.186	.250	.229	.064	1.344	.189	.272	.238	.034	.875	.182	.378	.243	.633
62 4	.520	.186	.463	.467	.277	2.489	.197	.480	.469	.010	.978	.032	.378	.096	.198
62 5	.520	.186	.654	.561	.468	3.516	.207	.669	.662	.007	.989	.017	.378	.057	.116
62 6	.520	.186	.825	.834	.639	4.435	.219	.840	.835	.005	.994	.010	.378	.040	.081
62 7	.870	.266	.310	.232	.044	1.165	.269	.338	.256	.082	.758	.341	.370	.294	1.212
62 8	.870	.266	.310	.235	.044	1.165	.269	.338	.258	.079	.765	.331	.370	.294	1.203
62 9	.870	.266	.321	.260	.055	1.207	.269	.348	.279	.069	.802	.282	.370	.279	.974
6210	.870	.265	.492	.486	.226	1.850	.272	.512	.491	.020	.960	.059	.370	.147	.314
6211	.870	.266	.672	.674	.406	2.526	.277	.689	.677	.012	.982	.027	.370	.092	.189
6212	.870	.266	.832	.837	.566	3.128	.283	.848	.839	.009	.989	.017	.370	.067	.135
6213	1.480	.387	.447	.290	.060	1.155	.391	.480	.334	.146	.696	.419	.359	.289	2.079
6214	1.480	.387	.447	.322	.060	1.155	.390	.480	.358	.122	.746	.356	.359	.289	1.668
6215	1.480	.387	.447	.339	.060	1.155	.390	.480	.371	.109	.774	.319	.359	.289	1.207
6216	1.480	.387	.588	.566	.201	1.519	.391	.613	.578	.036	.942	.086	.359	.192	.435
6217	1.480	.387	.719	.711	.332	1.858	.393	.741	.718	.022	.970	.045	.359	.142	.298
6218	1.480	.387	.842	.838	.455	2.176	.395	.862	.843	.018	.979	.032	.359	.112	.231
6219	1.990	.479	.546	.391	.067	1.140	.484	.583	.435	.148	.746	.355	.350	.288	2.512
6220	1.990	.479	.546	.407	.067	1.140	.483	.583	.448	.135	.768	.327	.350	.288	2.140
6221	1.990	.479	.559	.413	.080	1.167	.483	.595	.453	.142	.761	.337	.350	.278	2.112
6222	1.990	.479	.643	.594	.164	1.342	.482	.674	.613	.061	.910	.132	.350	.225	.555
6223	1.990	.479	.740	.712	.261	1.545	.483	.767	.725	.041	.946	.080	.350	.182	.414
6224	1.990	.479	.854	.836	.375	1.783	.484	.878	.846	.032	.964	.054	.350	.147	.315

Table 3. Continued.

CODE	0	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
63 1	.250	.233	.236	.236	.214	.201	.200	.177	.165	.177	.187	.189	.194	.197
63 2	.250	.238	.240	.240	.220	.207	.206	.200	.198	.177	.194	.191	.200	.209
63 3	.250	.243	.247	.248	.229	.217	.214	.216	.223	.222	.215	.218	.225	.222
63 4	.250	.478	.484	.486	.481	.481	.480	.480	.480	.479	.480	.482	.489	.495
63 5	.250	.676	.679	.683	.678	.679	.679	.679	.679	.579	.679	.680	.587	.693
63 6	.250	.830	.835	.838	.834	.835	.834	.834	.835	.834	.835	.836	.843	.849
63 7	.950	.356	.359	.359	.323	.287	.236	.206	.227	.219	.255	.213	.260	.270
63 8	.950	.357	.359	.359	.323	.289	.240	.217	.250	.224	.284	.246	.268	.287
63 9	.950	.362	.365	.367	.330	.305	.269	.289	.248	.299	.265	.294	.287	.301
6310	.950	.510	.514	.517	.500	.494	.491	.490	.487	.489	.493	.493	.500	.510
6311	.950	.680	.684	.687	.678	.674	.673	.671	.672	.672	.674	.673	.681	.688
6312	.950	.858	.870	.866	.859	.859	.857	.856	.858	.856	.859	.859	.864	.872
6313	1.440	.464	.468	.468	.425	.379	.308	.239	.210	.229	.275	.285	.311	.306
6314	1.440	.463	.469	.468	.424	.378	.305	.244	.230	.282	.303	.289	.317	.342
6315	1.440	.468	.470	.473	.428	.385	.322	.290	.347	.317	.330	.350	.345	.360
6316	1.440	.608	.612	.613	.588	.576	.575	.574	.570	.567	.575	.575	.582	.593
6317	1.440	.742	.746	.750	.732	.727	.723	.723	.722	.723	.725	.728	.733	.742
6318	1.440	.854	.860	.865	.853	.849	.846	.847	.844	.844	.848	.848	.855	.863
6319	2.000	.571	.575	.576	.512	.471	.387	.292	.242	.226	.273	.366	.298	.422
6320	2.000	.570	.577	.576	.525	.472	.385	.293	.255	.279	.375	.376	.352	.429
6321	2.000	.575	.580	.581	.530	.480	.398	.330	.350	.419	.387	.390	.408	.425
6322	2.000	.671	.675	.677	.640	.615	.602	.601	.613	.593	.609	.611	.621	.634
6323	2.000	.744	.747	.748	.720	.702	.698	.680	.698	.694	.687	.700	.707	.731
6324	2.000	.876	.880	.882	.860	.851	.846	.839	.845	.846	.848	.852	.860	.867

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
63 1	.250	.095	.203	.167	.108	2.137	.100	.230	.171	.059	.744	.358	.498	.160	.586
63 2	.250	.095	.208	.179	.113	2.189	.100	.234	.182	.052	.778	.314	.498	.154	.516
63 3	.250	.095	.213	.192	.118	2.242	.102	.239	.195	.044	.814	.265	.498	.148	.368
63 4	.250	.095	.448	.455	.353	4.716	.133	.473	.465	.007	.985	.022	.498	.049	.097
63 5	.250	.095	.646	.663	.551	6.800	.174	.670	.663	.007	.990	.015	.498	.028	.056
63 6	.250	.095	.800	.819	.705	8.421	.216	.824	.819	.005	.994	.009	.498	.020	.041
63 7	.950	.236	.326	.240	.090	1.381	.240	.364	.267	.098	.732	.374	.484	.298	1.497
63 8	.950	.236	.327	.257	.091	1.386	.240	.365	.280	.085	.767	.328	.484	.296	1.367
63 9	.950	.236	.332	.271	.096	1.407	.240	.370	.292	.078	.789	.249	.484	.290	1.086
6310	.950	.236	.480	.480	.244	2.034	.243	.511	.487	.024	.953	.070	.484	.167	.358
6311	.950	.236	.650	.558	.414	2.754	.249	.678	.662	.016	.976	.035	.484	.106	.215
6312	.950	.236	.828	.942	.592	3.508	.257	.854	.844	.010	.988	.018	.484	.074	.147
6313	1.440	.317	.434	.276	.117	1.369	.323	.477	.322	.154	.676	.444	.471	.294	2.193
6314	1.440	.317	.433	.312	.116	1.366	.322	.476	.348	.128	.732	.374	.471	.295	1.873
6315	1.440	.317	.438	.330	.121	1.382	.321	.480	.362	.118	.754	.345	.471	.290	1.263
6316	1.440	.317	.578	.563	.261	1.823	.323	.613	.574	.039	.937	.093	.471	.191	.426
6317	1.440	.317	.712	.712	.395	2.246	.326	.743	.719	.024	.968	.048	.471	.140	.291
6318	1.440	.317	.824	.833	.507	2.599	.329	.853	.838	.015	.982	.026	.471	.112	.228
6319	2.000	.400	.541	.392	.141	1.353	.409	.588	.436	.152	.742	.361	.461	.293	2.681
6320	2.000	.400	.540	.393	.140	1.350	.406	.587	.442	.146	.752	.348	.461	.294	2.180
6321	2.000	.400	.545	.395	.145	1.363	.404	.592	.439	.153	.741	.362	.461	.290	1.416
6322	2.000	.400	.641	.604	.241	1.603	.404	.682	.623	.059	.914	.127	.461	.227	.551
6323	2.000	.400	.714	.731	.314	1.785	.405	.751	.715	.036	.951	.072	.461	.193	.444
6324	2.000	.400	.846	.837	.446	2.115	.408	.880	.847	.033	.963	.055	.461	.150	.320

Table 3. Continued.

CODE	0	6.0	9.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
64 1	.500	.232	.238	.241	.229	.201	.186	.170	.174	.152	.175	.195	.182	.087
64 2	.500	.234	.241	.244	.223	.207	.196	.176	.195	.180	.167	.173	.198	.219
64 3	.500	.238	.244	.248	.228	.225	.212	.193	.193	.205	.211	.202	.210	.229
64 4	.500	.449	.456	.462	.458	.460	.459	.459	.457	.460	.462	.462	.471	.481
64 5	.500	.663	.673	.677	.675	.677	.677	.678	.680	.679	.680	.683	.690	.698
64 6	.500	.808	.837	.842	.841	.843	.843	.844	.845	.844	.847	.849	.856	.864
64 7	.910	.337	.344	.346	.315	.280	.229	.195	.193	.185	.222	.181	.246	.246
64 8	.910	.337	.343	.346	.315	.218	.231	.202	.228	.213	.257	.226	.254	.274
64 9	.910	.341	.347	.348	.320	.291	.253	.269	.240	.278	.244	.263	.277	.296
6410	.910	.532	.539	.542	.532	.528	.527	.526	.530	.528	.529	.534	.542	.551
6411	.910	.699	.707	.712	.704	.706	.705	.703	.705	.707	.709	.709	.718	.727
6412	.910	.847	.856	.860	.856	.857	.856	.856	.857	.858	.860	.862	.870	.878
6413	1.450	.455	.460	.464	.424	.378	.307	.242	.204	.198	.235	.290	.273	.292
6414	1.450	.454	.460	.463	.424	.379	.309	.241	.222	.260	.302	.285	.316	.328
6415	1.450	.457	.464	.469	.430	.388	.327	.303	.362	.311	.317	.360	.346	.377
6416	1.450	.594	.601	.605	.585	.570	.572	.564	.558	.565	.517	.570	.582	.594
6417	1.450	.743	.751	.755	.744	.739	.734	.733	.734	.734	.738	.740	.748	.760
6418	1.450	.851	.859	.864	.853	.852	.849	.847	.850	.851	.852	.857	.863	.874
6419	1.940	.551	.557	.560	.508	.461	.377	.285	.230	.208	.224	.333	.303	.407
6420	1.940	.505	.555	.559	.509	.455	.378	.287	.239	.251	.339	.370	.328	.413
6421	1.940	.558	.562	.556	.516	.472	.403	.355	.410	.446	.349	.409	.423	.437
6422	1.940	.649	.655	.661	.629	.604	.592	.593	.611	.583	.602	.600	.616	.626
6423	1.940	.773	.779	.784	.764	.748	.748	.745	.748	.749	.750	.757	.760	.778
6424	1.940	.861	.868	.874	.857	.846	.839	.844	.846	.847	.846	.851	.860	.872

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
64 1	.500	.129	.202	.057	.073	1.566	.163	.251	.188	.063	.750	.351	.630	.321	4.274
64 2	.500	.129	.204	.189	.075	1.531	.134	.253	.201	.052	.795	.291	.630	.317	1.147
64 3	.500	.129	.208	.199	.079	1.612	.134	.256	.210	.046	.819	.259	.630	.308	.884
64 4	.500	.129	.419	.451	.290	3.248	.148	.460	.453	.007	.985	.022	.630	.108	.214
64 5	.500	.129	.637	.668	.504	4.907	.171	.672	.669	.004	.995	.008	.630	.058	.115
64 6	.500	.129	.778	.834	.649	6.031	.191	.817	.835	-.018	1.021	-.032	.630	.043	.085
64 7	.910	.195	.307	.216	.112	1.574	.202	.360	.246	.114	.683	.435	.617	.312	1.804
64 8	.910	.195	.307	.244	.112	1.574	.201	.360	.268	.093	.743	.360	.617	.312	1.484
64 9	.910	.195	.311	.266	.116	1.595	.200	.364	.286	.078	.786	.304	.617	.306	1.100
6410	.910	.195	.502	.521	.307	2.574	.207	.546	.526	.020	.964	.054	.617	.149	.303
6411	.910	.195	.669	.697	.474	3.431	.216	.711	.700	.011	.985	.022	.617	.097	.193
6412	.910	.195	.817	.848	.622	4.190	.226	.858	.850	.008	.991	.013	.617	.072	.143
6413	1.450	.270	.425	.262	.155	1.574	.281	.483	.314	.169	.650	.476	.603	.305	2.449
6414	1.450	.270	.424	.298	.154	1.570	.278	.482	.338	.144	.701	.413	.603	.306	2.005
6415	1.450	.270	.427	.347	.157	1.581	.275	.485	.377	.108	.777	.315	.603	.303	1.182
6416	1.450	.270	.564	.564	.294	2.089	.277	.614	.575	.038	.937	.092	.603	.200	.496
6417	1.450	.270	.713	.730	.443	2.641	.283	.758	.737	.022	.971	.043	.603	.141	.286
6418	1.450	.270	.821	.844	.551	3.041	.286	.865	.849	.016	.982	.027	.603	.114	.228
6419	1.940	.331	.521	.377	.190	1.574	.346	.583	.422	.161	.724	.384	.594	.301	3.005
6420	1.940	.331	.475	.383	.144	1.435	.341	.542	.427	.115	.788	.301	.594	.346	2.362
6421	1.940	.331	.528	.407	.197	1.595	.336	.589	.446	.144	.756	.342	.594	.295	1.252
6422	1.940	.331	.619	.596	.288	1.870	.337	.674	.614	.060	.911	.131	.594	.232	.549
6423	1.940	.331	.743	.748	.412	2.245	.340	.793	.759	.034	.958	.063	.594	.177	.373
6424	1.940	.331	.831	.842	.500	2.511	.342	.879	.851	.028	.969	.047	.594	.149	.310

Table 3. Continued.

CODE	0	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
65 1	.480	.209	.217	.223	.202	.190	.159	.152	.113	.161	.144	.129	.161	.186
65 2	.480	.212	.219	.227	.208	.193	.173	.159	.162	.153	.166	.175	.182	.199
65 3	.480	.216	.275	.234	.217	.204	.202	.183	.187	.203	.207	.198	.203	.227
65 4	.480	.427	.439	.447	.447	.450	.439	.449	.452	.453	.455	.459	.466	.480
65 5	.480	.642	.653	.661	.663	.666	.667	.666	.674	.672	.674	.677	.685	.698
65 6	.480	.840	.852	.861	.862	.866	.866	.869	.870	.871	.873	.877	.884	.897
65 7	.970	.336	.346	.352	.324	.289	.234	.187	.176	.154	.160	.232	.222	.231
65 8	.970	.336	.346	.354	.323	.287	.235	.190	.182	.174	.212	.223	.237	.246
65 9	.970	.336	.347	.354	.325	.289	.236	.209	.240	.229	.259	.234	.274	.296
6510	.970	.530	.544	.549	.543	.539	.537	.537	.538	.539	.544	.548	.555	.569
6511	.970	.696	.710	.716	.712	.712	.712	.713	.715	.715	.719	.721	.731	.744
6512	.970	.839	.849	.859	.859	.860	.859	.859	.864	.863	.867	.870	.879	.891
6513	1.380	.427	.438	.445	.408	.364	.294	.218	.193	.179	.180	.271	.225	.281
6514	1.380	.427	.436	.445	.408	.365	.299	.231	.194	.192	.212	.279	.277	.293
6515	1.380	.427	.437	.445	.409	.367	.297	.237	.224	.271	.293	.292	.312	.353
6516	1.380	.603	.614	.624	.608	.602	.600	.596	.602	.597	.606	.611	.618	.633
6517	1.380	.731	.740	.749	.741	.739	.738	.737	.740	.739	.744	.747	.756	.772
6518	1.380	.830	.843	.851	.847	.841	.840	.845	.847	.847	.851	.853	.863	.866
6519	1.973	.542	.553	.565	.516	.466	.368	.288	.235	.201	.199	.291	.351	.402
6520	1.973	.546	.552	.561	.518	.465	.483	.282	.238	.221	.288	.377	.299	.425
6521	1.973	.530	.557	.567	.523	.472	.395	.337	.402	.434	.389	.407	.440	.450
6522	1.973	.669	.685	.692	.668	.654	.651	.625	.662	.637	.664	.646	.665	.680
6523	1.973	.787	.795	.812	.789	.774	.774	.774	.782	.781	.787	.793	.864	.814
6524	1.973	.858	.869	.876	.864	.852	.852	.850	.857	.859	.859	.867	.876	.890

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	F1-E4	E4/E1	1-E15	FN	F1	FB
65 1	.480	.108	.179	.156	.071	1.657	.122	.251	.172	.079	.685	.433	.789	.370	2.335
65 2	.480	.108	.182	.169	.074	1.685	.115	.254	.183	.071	.720	.389	.789	.361	1.294
65 3	.480	.108	.186	.197	.078	1.722	.115	.257	.207	.050	.805	.278	.789	.349	.933
65 4	.480	.108	.397	.450	.289	3.676	.132	.459	.452	.008	.984	.025	.789	.112	.223
65 5	.480	.108	.612	.668	.504	5.667	.163	.673	.669	.004	.994	.009	.789	.059	.117
65 6	.480	.108	.810	.867	.702	7.500	.204	.871	.868	.003	.995	.005	.789	.038	.077
65 7	.970	.175	.306	.201	.131	1.749	.191	.383	.241	.142	.628	.502	.773	.334	2.584
65 8	.970	.175	.306	.216	.131	1.749	.186	.383	.250	.133	.653	.472	.773	.334	2.065
65 9	.970	.175	.306	.266	.131	1.749	.183	.383	.289	.094	.753	.346	.773	.334	1.490
6510	.970	.175	.500	.539	.325	2.857	.190	.566	.545	.022	.961	.057	.773	.160	.319
6511	.970	.175	.666	.714	.491	3.806	.201	.730	.717	.012	.983	.026	.773	.104	.208
6512	.970	.175	.809	.861	.634	4.623	.212	.871	.863	.008	.990	.014	.773	.078	.155
6513	1.380	.223	.397	.251	.174	1.780	.241	.478	.302	.175	.633	.496	.765	.322	2.791
6514	1.380	.223	.397	.263	.174	1.780	.238	.478	.310	.168	.649	.477	.765	.322	2.462
6515	1.380	.223	.397	.323	.174	1.780	.233	.478	.354	.123	.741	.362	.765	.322	1.879
6516	1.380	.223	.573	.603	.350	2.570	.236	.643	.612	.031	.952	.071	.765	.186	.377
6517	1.380	.223	.701	.742	.478	3.143	.241	.768	.748	.020	.974	.038	.765	.137	.274
6518	1.380	.223	.800	.836	.577	3.587	.246	.865	.841	.024	.972	.042	.765	.113	.224
6519	1.973	.286	.512	.372	.226	1.790	.311	.597	.420	.177	.703	.411	.753	.314	3.303
6520	1.973	.286	.516	.395	.230	1.804	.303	.601	.437	.163	.728	.379	.753	.311	2.749
6521	1.973	.286	.500	.420	.214	1.748	.293	.587	.458	.129	.780	.311	.753	.326	1.349
6522	1.973	.286	.639	.650	.353	2.234	.295	.715	.666	.050	.931	.102	.753	.225	.500
6523	1.973	.286	.757	.784	.471	2.647	.299	.829	.795	.034	.959	.061	.753	.175	.358
6524	1.973	.286	.828	.860	.542	2.895	.301	.898	.869	.029	.968	.048	.753	.153	.309

Table 3. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
71 1	.509	.251	.250	.245	.231	.277	.226	.224	.223	.219	.222	.222	.228	.227
71 2	.509	.279	.278	.275	.262	.260	.259	.256	.257	.256	.255	.257	.262	.262
71 3	.509	.319	.320	.316	.308	.307	.302	.302	.302	.300	.301	.302	.308	.308
71 4	.509	.479	.480	.480	.471	.471	.468	.468	.468	.465	.466	.467	.472	.473
71 5	.509	.671	.672	.670	.663	.663	.661	.660	.660	.658	.659	.660	.667	.667
71 6	.509	.843	.845	.843	.835	.835	.834	.832	.833	.831	.831	.833	.837	.839
71 7	.972	.332	.328	.324	.305	.299	.296	.290	.284	.292	.296	.288	.298	.297
71 8	.972	.384	.383	.379	.363	.340	.357	.354	.350	.353	.351	.355	.364	.365
71 9	.972	.430	.430	.427	.413	.414	.409	.409	.404	.407	.408	.409	.414	.417
7110	.972	.541	.545	.541	.530	.529	.527	.526	.575	.519	.524	.524	.530	.533
7111	.972	.699	.700	.700	.690	.688	.687	.686	.685	.684	.684	.686	.691	.693
7112	.972	.837	.838	.833	.829	.829	.826	.827	.823	.822	.821	.824	.830	.832
7113	1.518	.407	.405	.400	.376	.364	.352	.347	.341	.350	.340	.332	.366	.359
7114	1.518	.435	.434	.429	.408	.399	.392	.387	.385	.376	.394	.401	.404	.404
7115	1.518	.465	.463	.459	.439	.431	.424	.421	.425	.421	.427	.424	.433	.435
7116	1.518	.574	.577	.575	.561	.557	.549	.551	.552	.557	.561	.557	.561	.564
7117	1.518	.716	.715	.713	.699	.701	.697	.694	.695	.694	.697	.697	.703	.705
7118	1.518	.846	.844	.845	.834	.829	.831	.831	.829	.828	.829	.831	.836	.839
7119	1.973	.464	.461	.453	.425	.402	.396	.394	.392	.376	.409	.397	.401	.411
7120	1.973	.484	.484	.476	.447	.434	.424	.421	.412	.427	.431	.447	.436	.435
7121	1.973	.512	.510	.505	.483	.478	.459	.459	.454	.458	.473	.446	.475	.475
7122	1.973	.614	.613	.611	.595	.584	.581	.581	.583	.583	.581	.585	.593	.597
7123	1.973	.735	.736	.735	.721	.716	.711	.722	.710	.712	.712	.713	.720	.720
7124	1.973	.846	.845	.846	.832	.826	.828	.826	.824	.825	.827	.829	.833	.834

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
71 1	.509	.000	.221	.197	.000	.000	.000	.230	.208	.022	.906	.138	.000	.286	.490
71 2	.509	.000	.249	.232	.000	.000	.000	.256	.240	.016	.938	.092	.000	.239	.377
71 3	.509	.000	.289	.278	.000	.000	.000	.294	.284	.011	.964	.053	.000	.191	.287
71 4	.509	.000	.449	.443	.000	.000	.000	.451	.445	.006	.987	.020	.000	.099	.140
71 5	.509	.000	.641	.637	.000	.000	.000	.642	.638	.004	.994	.009	.000	.058	.081
71 6	.509	.000	.813	.809	.000	.000	.000	.814	.810	.004	.995	.007	.000	.041	.056
71 7	.972	.000	.302	.267	.000	.000	.000	.320	.290	.030	.906	.138	.000	.342	.601
71 8	.972	.000	.354	.335	.000	.000	.000	.367	.349	.018	.952	.071	.000	.269	.445
71 9	.972	.000	.400	.387	.000	.000	.000	.410	.398	.012	.970	.045	.000	.224	.336
7110	.972	.000	.511	.503	.000	.000	.000	.517	.509	.008	.985	.023	.000	.155	.225
7111	.972	.000	.669	.663	.000	.000	.000	.673	.667	.006	.991	.013	.000	.104	.145
7112	.972	.000	.807	.802	.000	.000	.000	.809	.805	.005	.994	.009	.000	.078	.109
7113	1.518	.000	.377	.329	.000	.000	.000	.405	.365	.039	.903	.142	.000	.383	.723
7114	1.518	.000	.405	.374	.000	.000	.000	.429	.402	.027	.937	.092	.000	.344	.590
7115	1.518	.000	.435	.405	.000	.000	.000	.456	.429	.027	.941	.087	.000	.309	.491
7116	1.518	.000	.544	.534	.000	.000	.000	.557	.548	.009	.983	.025	.000	.221	.321
7117	1.518	.000	.686	.675	.000	.000	.000	.694	.684	.011	.985	.023	.000	.156	.222
7118	1.518	.000	.816	.809	.000	.000	.000	.822	.815	.007	.992	.013	.000	.120	.168
7119	1.973	.000	.434	.381	.000	.000	.000	.469	.427	.043	.909	.133	.000	.403	.767
7120	1.973	.000	.454	.405	.000	.000	.000	.486	.445	.041	.916	.123	.000	.376	.661
7121	1.973	.000	.482	.445	.000	.000	.000	.511	.478	.032	.937	.093	.000	.344	.582
7122	1.973	.000	.584	.567	.000	.000	.000	.603	.588	.016	.974	.039	.000	.258	.382
7123	1.973	.000	.705	.690	.000	.000	.000	.718	.704	.014	.980	.030	.000	.194	.278
7124	1.973	.000	.816	.804	.000	.000	.000	.826	.814	.012	.986	.021	.000	.156	.221

Table 3. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
72 1	.513	.233	.233	.230	.218	.216	.211	.209	.210	.208	.211	.211	.219	.220
72 2	.513	.258	.260	.259	.249	.244	.241	.243	.247	.244	.245	.247	.252	.254
72 3	.513	.295	.297	.297	.288	.288	.287	.287	.290	.286	.288	.288	.294	.298
72 4	.513	.457	.462	.461	.457	.457	.455	.455	.456	.455	.455	.457	.462	.466
72 5	.513	.649	.652	.654	.648	.649	.647	.647	.648	.646	.648	.649	.655	.660
72 6	.513	.826	.830	.830	.825	.826	.825	.825	.825	.823	.825	.826	.832	.836
72 7	1.510	.385	.383	.373	.358	.344	.329	.327	.321	.331	.311	.354	.344	.343
72 8	1.510	.410	.410	.408	.390	.389	.374	.369	.365	.364	.381	.387	.381	.387
72 9	1.510	.452	.454	.453	.439	.432	.428	.421	.425	.424	.431	.431	.440	.444
7210	1.510	.537	.540	.537	.529	.524	.522	.519	.518	.517	.521	.524	.532	.537
7211	1.510	.695	.695	.696	.688	.684	.686	.884	.685	.685	.687	.687	.695	.701
7212	1.510	.830	.832	.833	.826	.821	.822	.821	.822	.822	.824	.827	.833	.839
7213	1.960	.438	.437	.432	.408	.384	.361	.361	.378	.358	.410	.348	.404	.401
7214	1.960	.468	.470	.469	.450	.435	.423	.427	.410	.433	.421	.457	.437	.447
7215	1.960	.519	.520	.518	.503	.493	.489	.484	.490	.494	.498	.512	.499	.509
7216	1.960	.587	.590	.590	.580	.573	.580	.569	.565	.570	.570	.574	.579	.584
7217	1.960	.705	.707	.711	.701	.700	.697	.694	.700	.694	.697	.701	.704	.709
7218	1.960	.819	.819	.819	.819	.817	.814	.813	.815	.812	.816	.819	.819	.823
7219	.925	.302	.302	.299	.282	.282	.277	.267	.263	.262	.268	.270	.279	.283
7220	.925	.330	.332	.330	.316	.311	.308	.306	.306	.306	.309	.306	.312	.321
7221	.925	.373	.375	.374	.363	.360	.356	.356	.357	.351	.357	.361	.362	.372
7222	.925	.500	.503	.503	.495	.494	.494	.494	.493	.494	.494	.496	.503	.506
7223	.925	.689	.686	.686	.681	.682	.679	.684	.680	.679	.679	.681	.688	.696
7224	.925	.833	.836	.832	.831	.831	.831	.830	.830	.829	.829	.831	.837	.843

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
72 1	.513	.184	.203	.190	.019	1.103	.186	.228	.202	.026	.887	.165	.379	.327	.540
72 2	.513	.184	.228	.224	.044	1.239	.187	.251	.233	.018	.928	.106	.379	.275	.419
72 3	.513	.184	.265	.268	.081	1.440	.188	.286	.274	.012	.960	.060	.379	.219	.313
72 4	.513	.184	.427	.436	.243	2.321	.193	.444	.438	.006	.988	.019	.379	.107	.146
72 5	.513	.184	.619	.630	.435	3.364	.203	.635	.631	.003	.995	.008	.379	.061	.084
72 6	.513	.184	.796	.806	.612	4.326	.216	.811	.807	.004	.995	.008	.379	.042	.057
72 7	1.510	.393	.355	.313	-.038	.903	.395	.400	.353	.048	.881	.173	.358	.417	.802
72 8	1.510	.393	.380	.357	-.013	.967	.395	.421	.387	.034	.920	.118	.358	.376	.619
72 9	1.510	.393	.422	.414	.029	1.074	.395	.458	.437	.022	.953	.070	.358	.321	.489
7210	1.510	.393	.507	.507	.114	1.290	.396	.537	.522	.014	.973	.040	.358	.244	.351
7211	1.510	.393	.665	.671	.272	1.692	.398	.688	.680	.009	.988	.019	.358	.162	.226
7212	1.510	.393	.800	.809	.407	2.036	.400	.820	.815	.006	.993	.010	.358	.123	.170
7213	1.960	.473	.408	.371	-.065	.863	.474	.462	.419	.043	.906	.137	.352	.439	.865
7214	1.960	.473	.438	.417	-.035	.926	.475	.486	.455	.032	.934	.097	.352	.395	.662
7215	1.960	.473	.489	.479	.016	1.034	.475	.531	.508	.023	.956	.065	.352	.334	.507
7216	1.960	.473	.557	.554	.084	1.178	.476	.592	.575	.017	.971	.043	.352	.275	.396
7217	1.960	.473	.675	.679	.202	1.427	.477	.734	.693	.011	.985	.022	.352	.206	.287
7218	1.960	.473	.789	.793	.316	1.668	.478	.814	.803	.011	.987	.019	.352	.163	.224
7219	.925	.277	.272	.253	-.005	.982	.279	.306	.276	.030	.901	.145	.370	.380	.655
7220	.925	.277	.300	.291	.023	1.083	.279	.331	.308	.022	.932	.100	.370	.328	.505
7221	.925	.277	.343	.342	.066	1.238	.289	.370	.354	.015	.959	.062	.370	.269	.402
7222	.925	.277	.470	.476	.193	1.697	.282	.491	.482	.009	.983	.026	.370	.168	.232
7223	.925	.277	.659	.666	.382	2.379	.287	.677	.669	.007	.989	.017	.370	.101	.140
7224	.925	.277	.803	.813	.526	2.899	.291	.820	.815	.004	.995	.008	.370	.075	.102

Table 3. Continued.

CODE	Q	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
73 1	.497	.217	.219	.216	.208	.207	.202	.200	.202	.204	.204	.206	.208	.212
73 2	.497	.240	.233	.242	.238	.237	.237	.235	.235	.232	.237	.239	.237	.247
73 3	.497	.290	.295	.295	.287	.289	.288	.286	.288	.287	.290	.291	.287	.302
73 4	.497	.445	.449	.452	.454	.454	.453	.452	.453	.452	.453	.457	.458	.464
73 5	.497	.660	.664	.671	.667	.669	.668	.669	.669	.669	.670	.671	.674	.681
73 6	.497	.801	.807	.809	.810	.811	.811	.811	.812	.810	.812	.813	.814	.822
73 7	1.020	.292	.292	.291	.280	.285	.271	.257	.262	.259	.259	.259	.266	.277
73 8	1.020	.320	.323	.322	.308	.306	.301	.300	.298	.299	.302	.303	.311	.314
73 9	1.020	.348	.353	.351	.345	.343	.341	.329	.340	.341	.339	.344	.349	.354
7310	1.020	.485	.489	.491	.491	.489	.489	.489	.488	.489	.490	.494	.495	.502
7311	1.020	.673	.678	.681	.681	.681	.679	.680	.680	.680	.681	.684	.686	.693
7312	1.020	.811	.817	.821	.816	.817	.815	.843	.815	.815	.818	.819	.825	.832
7313	1.520	.368	.372	.372	.346	.329	.318	.314	.310	.320	.312	.344	.331	.341
7314	1.520	.395	.401	.402	.380	.370	.361	.361	.360	.364	.377	.360	.374	.386
7315	1.520	.434	.438	.438	.423	.419	.411	.406	.414	.414	.410	.409	.426	.434
7316	1.520	.553	.558	.560	.550	.547	.544	.545	.545	.542	.551	.550	.554	.566
7317	1.520	.708	.710	.715	.706	.708	.704	.704	.705	.705	.708	.711	.716	.724
7318	1.520	.816	.820	.823	.816	.817	.817	.814	.815	.814	.817	.819	.828	.833
7319	1.970	.423	.422	.420	.399	.377	.349	.354	.370	.351	.357	.352	.402	.389
7320	1.970	.457	.461	.460	.441	.427	.416	.417	.409	.419	.396	.458	.430	.438
7321	1.970	.498	.501	.501	.486	.477	.472	.471	.469	.469	.489	.471	.481	.500
7322	1.970	.588	.591	.593	.585	.579	.581	.575	.575	.580	.581	.586	.587	.598
7323	1.970	.706	.711	.711	.707	.704	.700	.702	.703	.705	.704	.709	.714	.719
7324	1.970	.823	.829	.829	.827	.824	.826	.822	.825	.824	.828	.830	.834	.837

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
73 1	.497	.151	.187	.182	.036	1.238	.154	.223	.195	.028	.873	.184	.494	.359	.561
73 2	.497	.151	.210	.217	.059	1.391	.155	.244	.226	.018	.928	.106	.494	.301	.433
73 3	.497	.151	.260	.272	.109	1.722	.156	.290	.278	.013	.957	.064	.494	.219	.303
73 4	.497	.151	.415	.434	.264	2.748	.164	.441	.436	.005	.988	.018	.494	.108	.147
73 5	.497	.151	.630	.651	.479	4.172	.181	.655	.652	.003	.995	.007	.494	.058	.079
73 6	.497	.151	.771	.792	.620	5.106	.196	.796	.793	.003	.996	.006	.494	.043	.058
73 7	1.020	.243	.262	.247	.014	1.056	.250	.312	.276	.036	.885	.167	.482	.444	.746
73 8	1.020	.248	.290	.284	.042	1.169	.251	.335	.306	.029	.913	.127	.482	.381	.582
73 9	1.020	.248	.318	.324	.070	1.282	.251	.360	.341	.019	.948	.077	.482	.332	.493
7310	1.020	.248	.455	.472	.207	1.835	.254	.488	.480	.008	.984	.023	.482	.194	.263
7311	1.020	.248	.643	.663	.395	2.593	.260	.671	.667	.004	.994	.009	.482	.115	.156
7312	1.020	.248	.781	.802	.533	3.149	.265	.808	.805	.003	.996	.006	.482	.086	.117
7313	1.520	.329	.338	.311	.009	1.027	.331	.396	.352	.045	.887	.164	.470	.451	.811
7314	1.520	.329	.365	.356	.036	1.109	.331	.419	.387	.031	.925	.111	.470	.402	.634
7315	1.520	.329	.404	.404	.075	1.228	.332	.452	.428	.024	.947	.079	.470	.345	.521
7316	1.520	.329	.523	.536	.194	1.590	.334	.561	.550	.012	.979	.031	.470	.235	.328
7317	1.520	.329	.678	.694	.349	2.061	.336	.711	.702	.008	.988	.018	.470	.159	.217
7318	1.520	.329	.786	.803	.457	2.389	.339	.816	.809	.007	.991	.013	.470	.127	.173
7319	1.970	.395	.393	.353	-.002	.995	.397	.460	.410	.050	.892	.157	.463	.467	.865
7320	1.970	.395	.427	.408	.032	1.081	.397	.487	.448	.040	.919	.119	.463	.412	.704
7321	1.970	.395	.468	.470	.073	1.185	.398	.522	.500	.022	.957	.063	.463	.359	.536
7322	1.970	.395	.558	.568	.163	1.413	.399	.603	.588	.015	.976	.036	.463	.276	.387
7323	1.970	.395	.676	.689	.281	1.711	.400	.714	.703	.012	.984	.024	.463	.207	.284
7324	1.970	.395	.733	.807	.398	2.008	.402	.828	.817	.010	.987	.019	.463	.163	.221

Table 3. Continued.

CODE	0	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
74 1	.505	.188	.189	.192	.187	.180	.178	.179	.178	.179	.186	.183	.188	.194
74 2	.505	.212	.215	.219	.218	.217	.214	.213	.215	.214	.217	.221	.223	.221
74 3	.505	.247	.254	.259	.258	.258	.257	.259	.259	.259	.262	.264	.265	.277
74 4	.505	.427	.435	.439	.443	.445	.444	.445	.446	.446	.449	.452	.454	.463
74 5	.505	.650	.658	.662	.666	.667	.667	.669	.670	.671	.672	.674	.678	.686
74 6	.505	.785	.792	.797	.801	.804	.803	.804	.806	.806	.807	.810	.813	.822
74 7	.940	.258	.261	.264	.256	.251	.234	.233	.235	.234	.237	.251	.249	.250
74 8	.940	.280	.285	.288	.277	.275	.274	.271	.282	.274	.274	.282	.280	.293
74 9	.940	.320	.327	.329	.326	.325	.322	.321	.323	.323	.327	.330	.333	.341
7410	.940	.491	.499	.505	.506	.506	.507	.506	.510	.509	.511	.513	.517	.526
7411	.940	.676	.683	.688	.690	.692	.692	.692	.693	.694	.696	.699	.703	.712
7412	.940	.791	.801	.804	.808	.811	.809	.811	.811	.812	.814	.817	.820	.829
7413	1.498	.340	.341	.340	.326	.310	.287	.292	.284	.294	.308	.312	.311	.320
7414	1.498	.351	.361	.363	.346	.344	.321	.315	.314	.327	.312	.331	.345	.352
7415	1.498	.383	.391	.394	.384	.377	.371	.366	.368	.364	.376	.393	.388	.395
7416	1.498	.526	.532	.536	.536	.531	.529	.531	.533	.533	.535	.529	.545	.555
7417	1.498	.683	.690	.694	.695	.696	.694	.694	.698	.697	.699	.702	.707	.717
7418	1.498	.800	.807	.812	.807	.813	.812	.812	.815	.815	.818	.820	.824	.833
7419	1.950	.403	.407	.408	.383	.361	.324	.311	.340	.346	.331	.379	.348	.373
7420	1.950	.422	.427	.427	.408	.387	.374	.382	.386	.371	.409	.402	.395	.408
7421	1.950	.435	.458	.462	.448	.434	.429	.429	.422	.439	.414	.451	.450	.460
7422	1.950	.540	.547	.551	.541	.542	.537	.532	.539	.544	.540	.546	.562	.569
7423	1.950	.686	.692	.697	.695	.691	.694	.692	.695	.694	.696	.701	.707	.716
7424	1.950	.793	.801	.806	.806	.804	.804	.804	.807	.802	.807	.811	.817	.826

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
74 1	.505	.130	.158	.164	.028	1.215	.133	.214	.180	.034	.843	.227	.629	.469	.702
74 2	.505	.130	.182	.191	.052	1.400	.134	.234	.203	.031	.869	.190	.629	.380	.514
74 3	.505	.130	.217	.247	.087	1.669	.136	.265	.254	.011	.960	.059	.629	.292	.395
74 4	.505	.130	.397	.433	.267	3.054	.146	.438	.435	.003	.994	.010	.629	.118	.160
74 5	.505	.130	.620	.656	.490	4.769	.169	.660	.657	.003	.996	.006	.629	.060	.082
74 6	.505	.130	.755	.792	.625	5.808	.188	.794	.793	.001	.998	.003	.629	.045	.061
74 7	.940	.199	.228	.220	.029	1.146	.202	.295	.251	.044	.850	.216	.618	.504	.813
74 8	.940	.199	.250	.263	.051	1.256	.203	.312	.285	.028	.911	.130	.618	.439	.628
74 9	.940	.199	.290	.311	.091	1.457	.203	.346	.327	.020	.943	.084	.618	.351	.476
7410	.940	.199	.461	.496	.262	2.317	.209	.506	.502	.004	.991	.013	.618	.175	.238
7411	.940	.199	.646	.682	.447	3.246	.217	.688	.685	.003	.996	.006	.618	.106	.143
7412	.940	.199	.761	.739	.562	3.824	.224	.802	.801	.000	.999	.001	.618	.083	.112
7413	1.498	.276	.310	.290	.034	1.123	.279	.388	.335	.053	.864	.197	.603	.506	.926
7414	1.498	.276	.321	.322	.045	1.163	.279	.396	.359	.038	.905	.139	.603	.481	.791
7415	1.498	.276	.353	.365	.077	1.279	.280	.422	.394	.028	.933	.099	.603	.417	.614
7416	1.498	.276	.496	.525	.220	1.797	.282	.550	.539	.011	.980	.030	.603	.250	.339
7417	1.498	.276	.653	.687	.377	2.366	.286	.700	.695	.005	.992	.011	.603	.166	.225
7418	1.498	.276	.770	.803	.494	2.790	.290	.815	.809	.006	.993	.011	.603	.129	.175
7419	1.950	.332	.373	.343	.041	1.123	.335	.458	.398	.060	.869	.190	.595	.500	1.035
7420	1.950	.332	.392	.378	.060	1.181	.335	.473	.423	.049	.896	.152	.595	.464	.775
7421	1.950	.332	.405	.430	.073	1.220	.335	.483	.465	.018	.963	.055	.595	.441	.648
7422	1.950	.332	.510	.539	.178	1.536	.337	.573	.561	.012	.979	.031	.595	.312	.434
7423	1.950	.332	.656	.686	.324	1.976	.339	.709	.700	.010	.986	.020	.595	.214	.290
7424	1.950	.332	.763	.796	.431	2.298	.341	.813	.806	.006	.992	.012	.595	.171	.231

Table 3. Continued.

CODE	0	6.0	8.0	10.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	18.0
75 1	.452	.167	.165	.160	.166	.159	.157	.157	.154	.153	.161	.169	.168	.180
75 2	.452	.177	.196	.191	.193	.194	.191	.190	.194	.197	.198	.302	.208	.217
75 3	.452	.239	.249	.256	.259	.260	.261	.262	.265	.264	.267	.272	.275	.279
75 4	.452	.417	.423	.431	.436	.440	.441	.443	.443	.446	.448	.449	.454	.466
75 5	.452	.640	.622	.670	.676	.678	.679	.681	.682	.682	.686	.689	.691	.705
75 6	.452	.774	.788	.794	.803	.802	.803	.805	.807	.808	.811	.813	.816	.829
75 7	.977	.257	.262	.259	.249	.241	.229	.224	.225	.234	.229	.224	.248	.250
75 8	.977	.269	.276	.284	.282	.279	.268	.261	.272	.267	.272	.275	.282	.302
75 9	.977	.306	.314	.321	.320	.317	.316	.315	.318	.318	.320	.329	.330	.342
7510	.977	.473	.483	.490	.495	.497	.494	.495	.500	.500	.501	.507	.510	.522
7511	.977	.665	.676	.683	.688	.691	.689	.691	.692	.693	.694	.701	.704	.718
7512	.977	.784	.791	.823	.806	.811	.810	.812	.813	.812	.818	.821	.824	.826
7513	1.487	.323	.331	.335	.316	.297	.269	.257	.381	.271	.296	.284	.319	.306
7514	1.487	.335	.347	.348	.333	.318	.304	.312	.311	.321	.314	.354	.341	.345
7515	1.487	.363	.374	.383	.368	.365	.357	.357	.357	.360	.377	.367	.377	.389
7516	1.487	.511	.521	.529	.530	.527	.527	.529	.532	.533	.535	.539	.546	.558
7517	1.487	.677	.686	.695	.698	.701	.698	.700	.702	.703	.706	.711	.706	.723
7518	1.487	.797	.809	.816	.820	.821	.821	.824	.825	.827	.832	.834	.838	.846
7519	1.950	.384	.389	.394	.378	.354	.309	.278	.291	.337	.314	.334	.353	.367
7520	1.950	.392	.401	.403	.386	.361	.330	.327	.355	.351	.352	.381	.373	.394
7521	1.950	.438	.448	.453	.443	.439	.421	.424	.418	.432	.402	.451	.447	.468
7522	1.950	.538	.547	.554	.551	.547	.549	.541	.545	.550	.554	.559	.565	.576
7523	1.950	.700	.712	.717	.717	.717	.714	.718	.718	.721	.724	.730	.734	.752
7524	1.950	.791	.791	.799	.801	.802	.801	.800	.805	.806	.810	.812	.817	.731

Table 3. Continued.

CODE	Q	YN	Y1	Y4	Y1-YN	Y1/YN	EN	E1	E4	E1-E4	E4/E1	1-E15	FN	F1	FB
75 1	.452	.104	.133	.150	.029	1.279	.108	.213	.165	.047	.778	.314	.786	.544	.829
75 2	.452	.104	.147	.187	.043	1.413	.109	.223	.197	.026	.883	.171	.786	.468	.634
75 3	.452	.104	.209	.249	.105	2.010	.112	.277	.255	.022	.919	.119	.786	.276	.374
75 4	.452	.104	.382	.436	.278	3.673	.127	.444	.438	.007	.985	.022	.786	.112	.151
75 5	.452	.104	.619	.675	.515	5.952	.160	.680	.676	.004	.994	.009	.786	.054	.078
75 6	.452	.104	.744	.799	.640	7.154	.191	.805	.800	.005	.994	.009	.786	.041	.056
75 7	.977	.176	.227	.220	.051	1.290	.180	.319	.254	.065	.796	.290	.772	.527	.904
75 8	.977	.176	.239	.272	.063	1.358	.181	.327	.294	.033	.898	.149	.772	.488	.696
75 9	.977	.176	.276	.312	.100	1.568	.181	.357	.329	.029	.920	.118	.772	.393	.533
7510	.977	.176	.443	.492	.267	2.517	.188	.511	.499	.013	.975	.037	.772	.193	.262
7511	.977	.176	.635	.688	.459	3.608	.199	.699	.691	.008	.989	.016	.772	.113	.153
7512	.977	.176	.754	.796	.578	4.284	.208	.817	.799	.018	.978	.033	.772	.087	.118
7513	1.487	.235	.293	.276	.058	1.247	.239	.397	.325	.071	.820	.257	.762	.547	1.087
7514	1.487	.235	.305	.315	.070	1.298	.239	.405	.353	.053	.870	.188	.762	.515	.820
7515	1.487	.235	.333	.359	.098	1.417	.240	.427	.388	.039	.909	.133	.762	.452	.629
7516	1.487	.235	.481	.528	.246	2.047	.243	.557	.542	.016	.972	.042	.762	.260	.353
7517	1.487	.235	.647	.693	.412	2.753	.249	.716	.701	.015	.979	.032	.762	.167	.226
7518	1.487	.235	.767	.816	.532	3.264	.254	.833	.822	.012	.986	.021	.762	.129	.175
7519	1.950	.284	.354	.337	.070	1.246	.288	.466	.394	.072	.846	.222	.752	.540	1.249
7520	1.950	.284	.362	.364	.078	1.275	.288	.471	.413	.059	.876	.180	.752	.522	.953
7521	1.950	.284	.408	.438	.124	1.437	.288	.507	.472	.035	.931	.102	.752	.437	.680
7522	1.950	.284	.508	.546	.224	1.789	.290	.593	.568	.025	.957	.063	.752	.314	.426
7523	1.950	.284	.670	.722	.386	2.359	.294	.744	.734	.010	.987	.020	.752	.207	.281
7524	1.950	.284	.751	.731	.467	2.644	.295	.822	.714	.108	.868	.191	.752	.175	.263