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A STUDY OF METHODS USED IN JAPAN AND THE U.S.A. FOR DESIGN OF WEB REINFORCEMENT IN REINFORCED CONCRETE

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16. Abstracts

Methods contained in the specifications of the Architectural Institute of Japan (AIJ) and the American Concrete Institute (ACI) for design of web reinforcement were studied to evaluate the relative probabilities of flexural and shear failures in reinforced concrete beams and columns proportioned on the basis of the AIJ and ACI methods.

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1. INTRODUCTION

1.1 Object and Scope

Design strategies for reinforced concrete based on the strength concept often have specifications which are intended to minimize the possibility of shear failure governing the strength of structural elements. Typically, the shear corresponding to flexural failure is set to exceed the shear corresponding to shear failure by a factor implicit in the over-estimate of the flexural and the underestimate of the shear capacity. The main objective of this study was to evaluate the probability of flexural failure in reinforced concrete elements proportioned according to the concepts contained in the specifications for reinforced concrete of the Architectural Institute of Japan (3) and of the American Concrete Institute (1).

In order to make as direct a comparison as possible of the expressions for strength (rather than the entire design specifications) the basic design constraints had to be contrived. Comparisons were made for an isolated prismatic element subjected to axial load, bending, and shear at both ends. The bending moments were assumed to increase monotonically under constant, if any, axial load. The element was proportioned for the shear corresponding to the development of flexural moments at both ends in accordance with expressions for flexural and shear strength given in the AIJ and ACI specifications. Probabilities of flexural failure were evaluated using the approach proposed by Ellingwood and Ang (4).

Studies were made for slenderness ratios (height to width of column) of 4 and 6, tensile reinforcement ratios of 0.6, 1.0 and 1.6%, web reinforcement ratios up to 2%, and axial-load stresses of zero and 60 kg/cm^2. Nominal values for concrete strength and steel yield stress were 210 kg/cm^2 and 3500 kg/cm^2.

The uncertainty estimates for the design expressions were evaluated using the extensive collection of experimental data developed in Japan and compiled and analyzed by Dr. Masaya Hirosawa (9). Because of the unavailability of Dr. Hirosawa's work in English, the data are summarized in Appendix A with brief descriptions of the types of tests. The scope of the data base is indicated by the series of histograms included in Appendix A.

Concrete strength variation was based on approximately 9000 test results compiled by the Tokyo Metropolitan Office over the years 1970-1974 (10). Variation of steel yield force was obtained from data provided by Kobe Steel, Japan (12). Estimates of dimensional variations were derived from sources in Japan and the United States (11, 17).

1.2 Acknowledgments

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The writers would like to record their appreciation of the advice by Professors Wilson Tang and Y. K. Wen of the Department of Civil Engineering.

Mrs. Patricia Lane's excellent work and her patience with Appendix B deserve acknowledgment.

The CDC Cyber 175 system of the Digital Computation Laboratory, University of Illinois, was used for the computations.

2. EVALUATION METHOD AND UNCERTAINTIES

2.1 Assumed Reliability Model

The reliability model (4,5) used for this study may be described as follows.

Consider Y as a random variable such as shear or flexural resistance. It may be a function of many other variables and written as follows:

$$Y = f\ (X_1,\ X_2,\ \ldots,\ X_n) \tag{2.1}$$

In practice, the function f and variables $X_1, \ldots, X_n$ must be provided by assumed models. To obtain the correct (actual) value of Y, corrective factors N_f and $N(X_i)$ are used, such as

$$f = N_f\ \hat{f} \tag{2.2}$$

$$X_i = N(X_i)\ \hat{X}_i \tag{2.3}$$

in which N_f, $N(X_i)$ and $\hat{X}_i$ are random variables with means $\overline{N}_f$, $\overline{N}(X_i)$ and $\overline{X}_i$ and coefficients of variation Δ_f, $\Delta(X_i)$ and $\delta(X_i)$, and $\hat{f}$ and $\hat{X}_i$ are the models of f and X_i. If $\hat{f}$ is a random function, there may be a variability δ_f about $\hat{f}$. However, the function is usually a deterministic function and δ_f will be zero.

Using first-order approximation, the mean value of X_i is

$$\mu(X_i) \simeq \overline{N}(X_i)\ \overline{X}_i \tag{2.4}$$

the total coefficient of variation for X_i is

$$\Omega(X_i) \simeq \sqrt{\Delta^2(X_i) + \delta^2(X_i)} \tag{2.5}$$

and the total coefficient of variation for the functional relation f is

$$\Omega_f \simeq \sqrt{\Delta_f^2 + \delta_f^2}$$

Therefore, by first-order approximation, the mean and coefficient of variation of Y will be obtained as follows (5)

$$\mu_Y = \bar{N}_f \; f \; (\bar{N}(X_1) \; \bar{X}_1, \; \bar{N}(X_2) \; \bar{X}_2, \; \ldots, \; \bar{N}(X_n) \; \bar{X}_n) \tag{2.6}$$

and

$$\Omega_Y^2 = \frac{1}{\mu_Y^2} \left[\left(\frac{\partial Y}{\partial N_f}\right)_\mu^2 N_f^2 \; \Omega_f^2 + \frac{\bar{N}_f^2}{\mu_Y^2} \sum_{i=1}^{n} \left(\frac{\partial f}{\partial x_i}\right)_\mu^2 \bar{N}^2(X_i) \; X_i \Omega^2(X_i) \right.$$

$$\left. + \sum_{i=1}^{n} \sum_{j=1}^{n} \left(\frac{\partial f}{\partial X_i}\right)\left(\frac{\partial f}{\partial X_j}\right) \rho(X_i, X_j) \; \bar{N}(X_i) \; \bar{N}(X_j) \; \bar{X}_i \; \bar{X}_j \; \Omega(X_i) \; \Omega(X_j) \right] \tag{2.7}$$

in which $\rho(X_i, X_j)$ is the coefficient of correlation between X_i and X_j.

For statistically independent R and S, which are, for example, resistance and load, respectively, the failure probability is easily obtained if the distribution is known or assumed (45). For the case of lognormally distributed R and S

$$P_f = 1 - \Phi \left[\frac{\ell n \left(\frac{\mu_R}{\mu_S} \sqrt{\frac{1 + \Omega_S^2}{1 + \Omega_R^2}} \right)}{\sqrt{\ell n \; [(1+\Omega_R^2)(1+\Omega_S^2)]}} \right] \tag{2.8}$$

in which Φ is the standard normal probability distribution function.

In this study, because the quantitative relationship between flexural resistance V_f and shear resistance V_s of reinforced concrete members is discussed, V_f and V_s are considered not to be statistically independent.

Failure probability refers to the difference or the ratio between V_f and V_s. The distributions of the difference and the ratio are assumed to be normal and log-normal. Flexural failure probability will be obtained by the following equations.

Assume

$$V_D = V_f - V_s \tag{2.9}$$

the flexural failure probability is

$$P_{sf} = P\ (V_D > 0)$$

$$P_{sf} = 1 - \Phi\left[\frac{0 - \mu(V_D)}{\mu(V_D)\ \Omega(V_D)}\right]$$

$$P_{sf} = \Phi\left[\frac{1}{\Omega(V_D)}\right] \tag{2.10}$$

And assume

$$V_R = V_f/V_s \tag{2.11}$$

the flexural failure probability is

$$P_{sf} = P\ (V_R > 1)$$

$$P_{sf} = 1 - \Phi\left[\frac{0 - \lambda}{\zeta}\right]$$

$$P_{sf} = \Phi\left[\frac{\lambda}{\zeta}\right] \tag{2.12}$$

in which

$$\lambda = \ln \mu(V_R) - \frac{1}{2} \zeta^2$$

$$\zeta = \sqrt{\ln(1 + \Omega^2(V_R))}$$

In the following discussion, these equations are used to calculate the probability of failure in flexure.

2.2 Shear and Flexural Capacities

In order to estimate shear and flexural capacities for reinforced concrete members, the following expressions are used. Two expressions for each capacity are considered. One set of equations, for flexure and shear, is based on ACI 318-77 (1) and the other set is based on AIJ (3).

(a) Shear Capacity

In ACI 318-77, shear strength is assumed to be given by the sum of the shear assigned to the concrete, V_c, and the shear assigned to the web reinforcement, V_s. The shear assigned to the concrete, V_c, is given by Eq. 2.13.

$$V_c = (1.9 \sqrt{f'_c} + 2500 \rho_w \frac{V_u d}{M_u})\, b_w d \qquad (2.13)$$

For members subject to axial compression, M_m may be substituted for M_u,

$$M_m = M_u - N_u \frac{(4h-d)}{8} \qquad (2.14)$$

but V_c shall not be taken greater than,

$$V_c = 3.5 \sqrt{f'_c}\, b_w d \sqrt{1 + \frac{N_u}{500A_g}} \qquad (2.15)$$

The shear assigned to the web reinforcement is

$$V_s = \frac{A_v f_y d}{s} \tag{2.16}$$

but V_s shall not exceed $8\sqrt{f'_c}\, b_w d$.

The standard of the Architectural Institute of Japan treats the problem of shear strength as follows. Arakawa's equation was proposed in 1971 for beams without axial force (3). In this study, a modified version of Arakawa's equation which considers effects of axial load is used (14).

$$V = \left[\frac{0.053(100p_t)^{0.23}(180 + F_c)}{M/Qd + 0.12} + 2.7\sqrt{p_w \sigma_{yw}} + 0.1\,\sigma_o \right] 0.8\, bD \tag{2.17}$$

V = total shear strength

p_t = tensile reinforcement ratio

F_c = compressive strength of concrete (nominal strength specified for design, in kg/cm^2)

M = maximum moment

Q = shear corresponding to maximum moment

d = effective depth, cm

p_w = web reinforcement ratio

σ_{yw} = specified yield stress for web reinforcement in kg/cm^2

σ_o = axial stress in kg/cm^2

b = width of section in cm

D = overall height of section in cm

(b) Flexural Capacity

According to ACI 318-77, flexural resistance, M_{fa} for a doubly reinforced rectangular section is written as

$$M_{fa} = (N + A_s f_s - A'_s f'_s) \left[1 - \eta \left(\frac{N + A_s f_s - A'_s f'_s}{f'_c \, bd} \right) d + \right.$$

$$\left. + A'_s f'_s (d-d') - N \left(\frac{d-d'}{2} \right) \right] \qquad (2.18)$$

M_{fa} = flexural capacity

N = axial force

A_s = area of tensile reinforcement

f_s = stress in tensile reinforcement

A'_s = area of compressive reinforcement

f'_s = stress in compressive reinforcement

η = $(k_2/k_1 k_3)$, factor describing properties of the concrete block in terms of the factors for force centroid, k_2, maximum stress, k_3, and shape of stress block, k_1.

f'_c = compressive strength of concrete

b = width of section

d = effective depth

d' = distance to centroid of compressive reinforcement from extreme fiber in compression

The steel stresses f_s and f'_s are determined according to the sectional dimensions and material properties. If $f_s = f_y$ and $f'_s < f_y$, f_s will be determined by the following equations,

$$f'_s = C_1 - \sqrt{C_1^2 + C_2} \qquad (2.19)$$

in which

$$C_1 = \frac{1}{2}\left(\frac{N}{A'_s} + \frac{A_s f_u}{A'_s} + \varepsilon_{cu} E_s\right) \tag{2.20}$$

$$C_2 = \left(\frac{k_1 k_3 f'_c\ bd'}{A'_s} - \frac{N}{A'_s} - \frac{A_s f_y}{A'_s}\right) \varepsilon_{cu} E_s \tag{2.21}$$

If f_s f_y and $f'_s = f_y$

$$f_s = -C_3 + \sqrt{C_3^2 + C_4} \tag{2.22}$$

in which

$$C_3 = \frac{1}{2}\left(\frac{N}{A_s} = \frac{A'_s f_y}{A_s} + \varepsilon_{cu} E_s\right) \tag{2.23}$$

$$C_4 = \left(\frac{k_1 k_3\ f'_c\ bd}{A_s} + \frac{A'_s f_y}{A_s} - \frac{N}{A_s}\right) \varepsilon_{cu} E_s \tag{2.24}$$

If $f_s = f_y$ and $f'_s = f_y$, M_{fa} calculated by substituting these values. The other case, $f_s < f_y$ and $f'_s < f_y$, is neglected here, because these conditions will not occur in usual design.

For the AIJ method, the simplified equation proposed in reference (3 and 14) is used. The maximum moment M_{fj} is expressed by Eq. 23, 24, or 25 depending on the magnitude of the axial force, N.

If

$$N_{max} \geq N > 0.4\ bDF_c,$$

$$M_{fj} = (0.8\ a_t \sigma_y D + 0.12\ bD^2 F_c)\ \frac{N_{max} - N}{N_{max} - 0.4\ bDF_c} \tag{2.25}$$

If $0.4bDF_c \geq N \geq 0$,

$$M_{fj} = 0.8\ a_t \sigma_y D + 0.5\ ND\ \left(1 - \frac{N}{bDF_c}\right) \tag{2.26}$$

If $0 > N \geq N_{min}$

$$M_{fj} = 0.8\, a_t \sigma_y D + 0.4\, ND \tag{2.27}$$

in which

$$N_{max} = bDF_c + a_g \sigma_y \tag{2.28}$$

$$N_{min} = a_g \sigma_y \tag{2.29}$$

$$a_g = a_t + a_c \tag{2.30}$$

N = axial force

a_t = area of tensile reinforcement

σ_y = specified yield stress of reinforcement

D = overall depth of section

b = width of section

F_c = compressive strength of concrete (nominal strength specified for design, in kg/cm^2)

2.3 Uncertainties

The uncertainties in the parameters of the equations in section 2.2 are shown in Table 2.1.

(a) Yield Stress of Reinforcement

Table 2.2 shows data for yield stress of reinforcement tested by Kobe Steel Co. (13). The mean value f_y of all the data for SD35* steel is 4073 kg/cm^2 and the coefficient of variation δ_y is 0.036. Commercial testing tends to increase f_y because of high strain-rate loading and because the reported stress refers to the upper yield point. These factors tend to increase the reported yield stress by 5% and 10%, respectively (15). Assuming that these values are the maximum error, the bias in $\bar{f}_y$ will be

$$\bar{\nu}(f_y) \simeq 0.92 \quad (2.31)$$

and the uncertainty** will be

$$\Delta(f_y) \simeq 0.58 \times \left(\frac{1.00-0.85}{1.00+0.85}\right)$$

$$= 0.047 \quad (2.32)$$

in which the distribution of this uncertainty is assumed to be uniform between 85% and 100% of mean value.

The values for f_y in Table 2.1 are obtained as follows. The estimated mean value is

$$\mu(f_y) = \bar{\nu}(f_y)\ \bar{f}_y$$

$$= 0.92 \times 4070$$

$$= 3474\ (\text{kg/cm}^2) \quad (2.33)$$

and the total uncertainty is

---

*JIS (Japan Industrial Standard), (S: structural, D: deformed, numeral refers to minimum yield stress in kg/mm^2

**Coefficient of variation for uniform distribution between a and b will be calculated as follows:

Because σ^2 is second moment of inertia around mean value, it is $(b-a)^2/12$. Then c.o.v. = $\sigma/\mu = 0.58\ \frac{b-a}{b+a}$

$$\Omega(f_y) = \sqrt{\delta^2(f_y) + \Delta^2(f_y)}$$

$$= \sqrt{0.036^2 + 0.047^2}$$

$$= 0.059 \qquad (3.34)$$

(b) Compressive Strength of Concrete

Table 2.3 shows cylinder-test data used for checking the compressive strengths of concrete in buildings in the Tokyo metropolitan area (10). The tests were executed by the Building Material Laboratory of Tokyo Metropolitan Office for 8 years from 1967 to 1974. The general trend is for the mean values and the coefficients of variation to decrase with time.

Concrete at a compressive strength of 210 kg/cm^2 was arbitrarily chosen for this study. The pertinent data from years 1970 through 1974 were used for statistical evaluation because the coefficient of variation over that period was reasonably stable.

From the data for the years 1970-1974, the mean value $\bar{f}'_c$ and the coefficient of variation $\delta(f'_c)$ of the compressive strength of concrete were found to be

$$\bar{f}'_c = 282 \ kg/cm^2$$

$$\delta(f'_c) = 0.079$$

There is likely to be a difference in compressive strength of concrete between upper and lower parts of a column because of the differences of the pressure when concrete is curing and because of the density of aggregates. The difference may be as high as 20% if concrete with large slump, for example 18 cm, is used. Because of this fact, the coefficient of variation $\Delta(f'_c)$ is assumed to be

$$\Delta(f'_c) = 0.58 \times \left(\frac{1.1 - 0.9}{1.1 + 0.9}\right) = 0.058. \qquad (2.35)$$

Bias is not considered because the difference in compressive strength between cylinder specimens and actual members depends on the curing conditions such as temperature and moisture, and is difficult to determine generally.

The value $\mu(f'_c)$ and $\Omega(f'_c)$ are

$$\mu(f'_c) = 282 \text{ kg/cm}^2 \qquad (2.36)$$

$$\Omega(f'_c) = \sqrt{\delta^2(f'_c) + \Delta^2(f'_c)}$$

$$= 0.098 \qquad (2.37)$$

(c) Geometrical Variables

Uncertainties in the geometrical variables b, h, d' and s largely depend on the construction method. There is some difference in uncertainties between prefabricated structures and cast-in-place structures (11, 16). In this study only cast-in-place construction was considered. Tables 2.4-2.9 show the measurements of the above variables for beams and columns measured in cast-in-place structures. Because there are considerable differences between these structures, the most conservative values are used. Values used are shown in Table 2.1.

(d) Other Variables

The uncertainties of k_1k_3, η and ε_{cu} which are the variables for the equation based on the ACI concept are assumed to be the same as those given in reference 4 and 5. The other variables of the equations are considered to be deterministic.

(e) Correction Factors

Correction factors of the equations are obtained as follows.

More than 500 column data developed in Japan were used for determining these values (9 and 13). Descriptions and results of the tests are included in Appendix A.

To evaluate the uncertainties of correction factor for equations to calculate flexural strength, only the data for which yield loads are reported are used. For the shear equations, the data with following conditions are used except the data without reporting yield loads.

For Eq. 2.11,

$$a/d \geq 2.0$$

$$\rho_n f_y \leq 8.0 \sqrt{f'_c}$$

and for Eq. 2.15

$$1.0 \leq a/d \leq 3.0$$

$$N/A_g < 80 \text{ kg/cm}^2$$

$$0.2 \leq \rho_n \leq 1.2\%$$

where,

a: shear span

d: effective depth

ρ_n: web reinforcement ratio

f'_c: compressive strength of concrete in psi

N: axial force

A_g: total area of section

From this study, the values in Table 2.10 were obtained.

3. RELIABILITY FOR FLEXURAL FAILURE

3.1 Calculation of Failure Probability

As described in Section 2.1, two different distributions are considered for calculating the failure probability in flexure. The distribution for the difference between shear and flexural strengths, $V_s - V_f$, is assumed to be normal and the distribution for the ratio V_s/V_f, is assumed to be lognormal. Expressions for partial derivatives of $V_s - V_f$ and V_s/V_f with respect to their components are given in Appendix B.

Calculations refer to reinforced concrete members subjected to axial load and shear generated by end moment. Sections are assumed to be square and doubly reinforced. The nominal values used are as follows:

b = 40 cm, width of section

h = 40 cm, overall height of section

d' = 4 cm, cover to centroid of reinforcement

$A_s = A'_s$ = 10.14 cm^2, 15.21 cm^2, 25.35 cm^2, reinforcement at one face

A_v = 2.54 cm^2, cross-sectional area of one hoop (both legs of 13 mm bar)

f'_c = 210 kg/cm^2, compressive strength of concrete

f_y = 3500 kg/cm^2, yield stress for longitudinal and transverse reinforcement

ℓ = 160 cm, 240 cm, 320 cm, clear span

N/A_g = 0, 60 kg/cm^2, average compressive stress.

In the calculations, amount of longitudinal reinforcement, span length, axial stress and amount of web reinforcement are varied. Each component is assumed to be independent, except b and h which are assumed to have a correlation factor of unity.

3.2 Probability of Flexural Failure

Figure 3.1 - 3.12 summarize the results obtained. The ordinate indicates the probability of flexural failure and the abscissa indicates web reinforcement ratio. The broken lines show the values based on the ACI equations and the solid lines show the values based on the AIJ equations. Solid squares and triangles indicate the upper and lower limits of web reinforcement ratio according to ACI and AIJ. Solid circles indicate the web reinforcement ratio obtained directly from the design equations given by AIJ and ACI.

The upper limit of web reinforcement ratio for ACI is based on the condition that $\rho_n f_y$ shall not exceed 8 $\sqrt{f'_c}$ (in psi). In this case the upper limit of web reinforcement ratio ρ_n is 0.87%. The lower limit refers to the requirement that the spacing of web reinforcement shall not exceed half of the effective depth. This limit is 0.35%. For AIJ, the upper and lower limits of web reinforcement ratio are specified directly to be 1.2% and 0.2%, respectively. (Maximum spacing is 20 cm for columns).

The design total shear was obtained from the limiting flexural moments applied at the ends of the clear span.

Web reinforcement according to ACI was determined as follows.

(1) Calculate flexural capacity using Eq. 2.18.

(2) Calculate design total shear, V_n, as $(2M_f/\ell)$

(3) Calculate web reinforcement ratio, $\rho_n = (A_v/b_w s)$, from

$$\rho_n = \left(\frac{V_n}{\phi} - V_c\right)/(f_y b_w d) \qquad (3.1)$$

where,

ρ_n = web reinforcement ratio

A_v = total cross-sectional area of all legs of a stirrup

b_w = width of section

s = space of web reinforcement

V_n = flexural capacity

V_c = shear capacity assigned to the concrete

ϕ = strength reduction factor

= 0.85 for shear

f_y = yield stress of web reinforcement

d = effective depth

Web reinforcement according to AIJ was determined as follows

(1) Calculate flexural capacity using Eq. 2.25-2.27.

(2) Calculate design total shear as $(2\, M_f/\ell)$.

(3) Calculate web reinforcement ratio from

$$p_w = \frac{Q_D/bj - f_s}{0.5\ {}_wf_t} + 0.002 \qquad (3.2)$$

In which

p_w = web reinforcement ratio

Q_D = design shear force

b = width of section

$j = \frac{7}{8}\, d$

d = effective depth

f_s = allowable shear stress of concrete

= smaller value of $F_c/30$ or $(5 + F_c/100)$

F_c = specified compressive strength of concrete

${}_wf_t$ = allowable stress for web reinforcement

= 3300 kg/cm^2 for SD35 grade steel

The results of the calculations for probability of flexural failure are plotted in Fig. 3.1 through 3.12. Each figure shows the variation of p_{ff}, the calculated probability of flexural failure, with ρ_n, the web reinforcement ratio, and includes a pair of solid (based on AIJ) and a pair of broken (based on ACI) curves. For each method, values of p_{ff} are plotted on each figure for no axial load and $(N/A_g) = 60$ kg/cm^2. The tabulation below provides a key to the figures.

		(a/h) = 3			(a/h) = 2		
$100*(A_s/bh)$	=	.63	.95	1.58	.63	.95	1.58
$(V_s - V_f)$ distribution normal		3.1	3.2	3.3	3.4	3.5	3.6
(V_s/V_f) distribution lognormal		3.7	3.8	3.9	3.10	3.11	3.12

It should be noted that h is the overall height of section and A_s refers to the amount of longitudinal reinforcement on one face of the section.

Estimates of p_{ff} from Fig. 3.1 through 3.6 are summarized in Fig. 3.13 to compare the values of p_{ff} based on the two methods. The general trends are similar for p_{ff} obtained from the two methods: the estimated probability of flexural failure decreases with increase in amount of longitudinal reinforcement, increase in axial load, and decrease in shear-span-to-section-height ratio. However, there is in most of the cases considered, a discrepancy between the individual values of p_{ff} based on the two methods, the discrepancy tending to get larger with increase in the amount of longitudinal reinforcement. The trends recorded in Fig. 3.14, for lognormal distribution are similar.

The shears corresponding to flexural and shear limits for the AIJ and ACI methods are compared in Fig. 15 and 16 for the square section considered. In Fig. 15, it is seen that, as would be expected for sections of which flexural strength is controlled by yielding of tensile reinforcement, there is relatively little difference in V_f according to AIJ and ACI, and V_f varies almost linearly with the amount of web reinforcement. Values of V_s are relatively insensitive to the amount of longitudinal reinforcement for both methods. However, the relative values of V_s and V_f are drastically different for the two methods at different values of (A_s/bh) and ρ_n. It is evident that in any region where the relative magnitudes of V_f to V_s reverse for the two methods (e.g. $(A_s/bh) = 1.6\%$ in Fig. 15a), the calculated value of p_{ff} is bound to be different for V_s based on ACI or AIJ.

The trends of V_s with (A_s/bh) illustrated in Fig. 15a are similar for the two methods. Calibrated against the same population of data, the two methods could be adjusted to yield comparable values. However, the trends illustrated in Fig. 16 (shear capacity, V_s, versus web reinforcement ratio, ρ_n) are dissimilar for AIJ and ACI. To make them yield comparable results would require an adjustment which varies with the web reinforcement ratio, ρ_n, which is tantamount to changing the basic form of one or both of the equations. Corrected, with respect to the data population, only with "flat-rate" bias factors (1.01 for AIJ and 1.28 for ACI) the two methods will not yield comparable values of V_s at all values of ρ_n. Values of p_{ff} calculated from the two methods will vary considerably in cases where the relationships between magnitudes of V_f and V_s are reversed.

Because neither the ACI nor the AIJ method for V_s may be taken as the correct method for all combinations of the critical parameters, it is untenable to hold a brief for values of p_{ff} calculated from one of the methods. Nevertheless, the information in Fig. 3.1 to 3.6 does have its uses, particularly in cases where both methods result in comparable values of p_{ff}.

Consider the probabilities of flexural failure for the element in question with (a/h) = 3.

The amounts of web reinforcement required according to AIJ and ACI are shown in Fig. 3.1 through 3.3. For the estimates of p_{ff} tabulated below, web reinforcement has been chosen as the larger of the amounts indicated for "minimum" and "calculated." For each case, two values of p_{ff} were determined from the curves, one based on the AIJ expressions and the other (tabulated in parentheses) on the ACI expressions. The results for ACI are distorted considerably by the fact that the web reinforcement was assumed to be cut from 13-mm bars. Assuming a smaller-diameter bar would have reduced the "minimum" leading to lower estimates of p_{ff} for the case with no axial load.

N = 0, $100*(A_s/bh)$ =	0.63	0.95	1.58
for ρ_n required by AIJ	95(91)	89(91)	72(81)
for ρ_n required by ACI	96(93)	84(88)	35(74)
(N/A_g) = 60 kg/cm^2, $100*(A_s/bh)$ =	0.63	0.95	1.58
for ρ_n required by AIJ	88(92)	83(92)	68(92)*
for ρ_n required by ACI	74(80)	56(72)	32(72)

(*not allowed by AIJ)

Based on either set of estimates, it would appear that the probability of flexural failure is reduced as the longitudinal reinforcement ratio or the axial load increases. The AIJ requirements for web reinforcement, which are considerably more demanding than the ACI requirements as illustrated in Fig. 3.1 through 3.6, appear to be acceptable for the higher longitudinal reinforcement ratios considered.

It is of interest to compare directly the amounts of web reinforcement required by calculation for developing the flexural strength according to AIJ and ACI. Amounts of web reinforcement ratio, in percent, actually required by the two methods (ignoring minimum requirements) are listed below for (a/h) = 3.0.

$N = 0$, $100*(A_s/bh) =$	0.63	0.95	1.58
AIJ	0.23	0.48	1.0
ACI	0.03	0.12	0.33
$(N/A_g) = 60\ kg/cm^2$, $100*(A_s/bh) =$	0.63	0.95	1.58
AIJ	0.84	1.1	1.6
ACI	0.24	0.35	0.55

Using 13-mm bars, the minimum web reinforcement ratio for ACI was calculated to be 0.35%. With 9.5 mm bars (No. 3), the minimum could have been reduced to 0.2%, in which case it would have governed only for the case of no axial load for $(100*A_s/bh)$ equal to 0.63 and 0.95.

4. SUMMARY

Methods contained in the specifications of the Architectural Institute of Japan (AIJ) and the American Concrete Institute (ACI) for design of web reinforcement were studied to evaluate the relative probabilities of flexural and shear failures in reinforced concrete beams and columns proportioned on the basis of the AIJ and ACI methods.

(1) The coefficients of variation obtained from the available field and laboratory data for material strength, geometrical dimensions, and design equations were:

Yield stress of reinforcement	0.020 - 0.041
Compressive strength of concrete	0.045 - 0.134
Beam width	0.005 - 0.016
Column width or height	0.001 - 0.007
Concrete cover	0.090 - 0.247
Spacing of web reinforcement	0.036 - 0.113
Design method for flexural capacity	
AIJ (Japan)	0.158
ACI (U.S.A.)	0.125
Design method for shear capacity	
AIJ (Japan)	0.262
ACI (U.S.A.)	0.469

(2) For shear and flexural capacities calculated directly on the basis of the AIJ and ACI design methods

(a) there was relatively little difference in flexural capacity, V_f, for the two methods

(b) calculated shear capacity, V_s, was relatively insensitive to the amount of longitudinal reinforcement for both AIJ and ACI

(c) relative values of V_s and V_f were drastically different for the two methods at different values of longitudinal and web reinforcement ratios,

(d) design shear capacities V_s had different trends with the amount of web reinforcement for AIJ and ACI.

Items (a), (b), and (d) above are evident from the arrangements of the variables in the design expressions for the two methods.

(3) The estimated probability of flexural failure p_{ff}, for a given amount of longitudinal reinforcement, decreased with increase in axial load and decrease in shear-span-to-section-height ratio for both methods. However, there was in most cases considered a difference between the values of p_{ff} based on the two methods and the difference tended to increase with the increase in the amount of longitudinal reinforcement. The discrepancy is caused by the large differences in the inter-relationship of the quantities V_s and V_f.

(4) At slenderness ratio of six (ratio of clear height to side dimension of column), calculated probabilities of flexural failure, p_{ff}, were found to decrease with an increase in longitudinal reinforcement ratio and axial load for both AIJ and ACI, with p_{ff} calculated for ACI requirements decreasing at a faster rate. For this case, the AIJ web-reinforcement requirement was approximately three times as much as the ACI requirement.

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TABLE 2.1 UNCERTAINTIES IN DESIGN PARAMETERS

Parameter	Estimated Mean	Basic Variability	Prediction Uncertainty	Total Uncertainty
f_y (σ_y,σ_{yw})*	3747 kg/cm^2	0.036	0.047	0.059
f'_c (F_c)*	282.4 kg/cm^2	0.079	0.058	0.098
b,h (b,D)*		0.016		0.016
d' (d_t)*	4.56^{cm}	0.247		0.247
S (S)*		0.113		0.113
k_1k_3	0.72			0.130
η	0.59			0.050
ε_{cu}	0.004			0.156

*Notations in parentheses are those used in Japan.

TABLE 2.2. STRENGTH OF REINFORCING BARS (Ref. 12)

Grade*	Bar** Size	Number of Tests	Yield Stress			Strength		
			$\overline{x}$ Kg/mm^2	s Kg/mm^2	s/$\overline{x}$	$\overline{x}$ Kg/mm^2	s Kg/mm^2	s/$\overline{x}$
SD35	D13	170	42.23	0.967	0.0229	60.09	1.438	0.0239
	D16	983	40.33	0.975	0.0242	59.50	1.374	0.0231
	D19	829	39.41	0.783	0.0199	58.99	1.175	0.0199
	D22	835	39.70	0.822	0.0222	59.50	1.161	0.0195
	D25	1318	41.21	1.430	0.0347	59.14	1.676	0.0197
	D29	576	41.67	1.215	0.0292	59.92	1.438	0.0240
	D32	640	41.25	1.172	0.0284	59.66	1.385	0.0232
	D35	118	41.76	1.210	0.0290	60.43	1.488	0.0246
	D38	243	41.88	1.300	0.0310	60.74	1.563	0.0257
	D51	59	43.49	1.765	0.0406	60.46	1.851	0.0306
SD40	D16	14	47.43	0.942	0.0199	63.93	1.805	0.0282
	D19	28	47.26	1.768	0.0374	64.56	2.229	0.0345
	D22	22	46.57	1.825	0.0392	64.47	2.072	0.0321
	D25	87	46.19	1.283	0.0278	64.07	1.516	0.0237
	D29	50	46.87	1.624	0.0346	65.51	1.946	0.0297
	D32	35	47.26	1.352	0.0286	65.92	1.635	0.0248
	D38	41	46.35	1.083	0.0234	64.81	1.245	0.0192

*JIS Standard (S: structural, D: deformed, numeral refers to minimum yield stress in Kg/mm^2)

**JIS Standard (D: deformed, numeral refers to nominal size in mm)

TABLE 2.3 COMPRESSIVE STRENGTH DISTRIBUTION OF READY-MIX CONCRETE TESTED AT THE BUILDING MATERIAL LABORATORY OF THE TOKYO METROPOLITAN OFFICE (Ref. 10)

Year	Nominal (Design) Strength kg/cm^2	Number of Mixes	Mean Strength kg/cm^2	Standard Deviation kg/cm^2	Mean / Nominal	Coefficient of Variation
1967	150	1187	235	31.6	1.51	0.134
	180	3464	259	30.8	1.41	0.119
	210	2070	292	30.4	1.39	0.104
	225	258	303	31.5	1.35	0.104
	Total	5979				
1968	150	191	243	-	1.62	-
	180	5576	257	-	1.43	-
	210	3776	288	-	1.37	-
	225	506	304	-	1.35	-
	Total	10,049				
1969	180	2779	252	23.2	1.40	0.092
	210	1785	283	26.4	1.35	0.093
	225	297	308	28.3	1.37	0.092
	270	22	347	28.4	1.29	0.082
	Total	4883				
1970	150	19	218	11.8	1.46	0.054
	180	2723	256	21.6	1.42	0.084
	210	2187	285	22.5	1.36	0.079
	225	480	295	21.6	1.31	0.073
	240	7	328	29.0	1.37	0.088
	Total	5416				
1971	180	2061	254	19.7	1.40	0.078
	210	2603	280	22.3	1.33	0.080
	225	638	294	21.6	1.30	0.073
	240	6	311	14.1	1.29	0.045
	Total	5308				
1972	180	654	250	19.7	1.39	0.079
	210	2033	284	22.4	1.35	0.079
	225	395	296	22.3	1.32	0.075
	240	640	320	23.6	1.33	0.074
	270					
	Total	3722				
1973	180	237	250	17.4	1.39	0.070
	210	1844	281	21.5	1.34	0.077
	225	208	303	21.6	1.35	0.071
	240	25	299	35.2	1.25	0.118
	270					
	Total	2314				
1974	180	86	243	15.5	1.35	0.064
	210	322	281	20.2	1.34	0.072
	225	22	296	20.2	1.32	0.068
	240					
	270					
	Total	430				

Notes:
1. Normal weight aggregate.
2. Number of mixes is understood to refer to one day's casting for a particular job. Number of 150*300-mm cylinders for each "mix" is at least three.
3. Starting in 1972, statistical data were obtained only from jobs having 20 or more "mix" results.
4. Data published in annual reports of Cement Association, Tokyo, Japan.

TABLE 2.4. BEAM DIMENSIONS (Ref. 17)

Building	Width or Overall Depth	Number of Beams or Joints	Observations Nominal in. (mm)	$\bar{x}$ in. (mm)	s in. (mm)	$s/\bar{x}$
Wilmore Laboratory	W*	12	12(x18)** (305)	12 (305)	1/16 (1.16)	0.0052
Jorden-Hare Stadium	W*	48	12 (305)	12 (305)	1/16 (1.16)	0.0052
	D*		18 (457)	17 3/4 (451)	3/16 (4.8)	0.0106
Memorial Coliseum	D*	196	7(x16 1/2)** (178)	15 7/8 (403)	1/4 (6.4)	0.0157

*W; width D; overall depth

**Overall depth

TABLE 2.5. DIMENSION OF BEAM WIDTH (Ref. 11)

Location	Building Identification	Number of Observations	Observations			
			Nom. mm	$\bar{x}$ mm	s mm	$s/\bar{x}$
Tohoku	TO-1	25	300(x750)*	300.2	4.7	0.0155
		15	300(x600)*	304.0	3.1	0.0101
		19	300(x750)*	302.0	4.1	0.0135
		14	300(x600)*	303.4	2.3	0.0076

*Overall depth

TABLE 2.6. COLUMN SECTIONAL DIMENSIONS (Ref. 11)

Location	Building Identification	Number of Observations n	Nominal Dimension mm	Mean $\bar{x}$ mm	Standard Deviation s mm	Coefficient of Variation $s/\bar{x}$
Niigata	KA-1	120	500	500.7	2.7	0.0054
Tokyo	KA-2	15	650	651.4	4.2	0.0065
		15	550	551.5	3.2	0.0058
Gifu	CH-1	189	700	699.7	4.8	0.0069
	KY-1	60	500	501.8	2.3	0.0045
		60	500	501.0	2.4	0.0047
	KY-2	60	550	551.2	1.1	0.0020
		60	550	551.9	1.6	0.0028
Kyushu	KY-3	36	450	452.2	2.7	0.0059
		36	550	552.6	2.4	0.0043
		36	450	451.1	1.2	0.0023
		36	550	551.0	1.1	0.0020
	KY-4	36	400	401.0	1.0	0.0024
		36	700	700.8	0.9	0.0013
		36	400	401.0	1.0	0.0025
		36	700	700.2	0.7	0.0009

TABLE 2.7. MEASUREMENTS OF CONCRETE COVER FOR BEAM BARS (Ref. 17)

Building	Number of Beams or Joists	Overall Dimension in. x in. (mm x mm)	Bar Size (mm)*	Concrete Cover Nominal in. (mm)	$\bar{x}$ in. (mm)	s in. (mm)	$s/\bar{x}$
Wilmore Laboratory	18[b]	12x18 (305x457)	#7 (22)	3/4 (19.1)	0.88 (22.4)	0.40 (10.2)	0.455
Jorden-Hare Stadium	48[b]	12x18 (305x457)	#8 (25)	1 (25.4)	1.04 (26.4)	0.47 (11.9)	0.452
East Addition	48[t]	12x18 (305x457)	#8 (25)	1 1/2 (38.1)	1.61 (40.9)	0.62 (15.8)	0.385
Memorial Coliseum Facilities	58[b]	7x16 1/2 (178x419)	#5 (16)	3/4 (19.1)	0.84 (21.3)	0.34 (8.6)	0.405
	22[t]	7x16 1/2 (178x419)	#5 (16)	2 (50.8)	2.03 (51.6)	0.27 (6.9)	0.133
Memorial Coliseum Concourse	138[b]	7x16 1/2 (178x419)	#6 (19)	3/4 (19.1)	0.72 (18.3)	0.26 (6.6)	0.361
	44[t]	7x16 1/2 (178x419)	#7 (22)	2 (5.1)	1.97 (50.0)	0.36 (9.1)	0.183

*Converted to nearest JIS standard size

[t]Cover on top bars

[b]Cover on bottom bars

TABLE 2.8. MEASUREMENTS OF CONCRETE COVER FOR COLUMN BARS (Ref. 11)

Location	Building Indentifi-cation	Number of Obser-vations	Overall Dimension (mm)	Concrete Cover Nominal (mm)	$\bar{x}$ (mm)	s (mm)	$s/\bar{x}$
Niigata	KA-1	48	500x500	40	41.1	3.7	0.090
Tokyo	KA-2	30	550x650	30	31.4	2.8	0.091
		12	550x650	30	32.7	2.6	0.079
Tochigi	KA-3	179	___*	30	29.9	7.4	0.247
	KA-4	48	___*	30	34.3	3.4	0.099

*Sectional dimensions are not reported

TABLE 2.9. MEASUREMENTS OF SPACING FOR WEB REINFORCEMENT IN COLUMNS (REF. 11)

Location	Building Identification	Number of Observations	Dimension of Column (mm)	Distance of Web Reinforcement			
				Nominal (mm)	$\bar{x}$ (mm)	s (mm)	$s/\bar{x}$
Niigata	KA-1	448	500x500	100	104.0	11.8	0.113
Tokyo	KA-2	33	550x650	100	98.4	3.6	0.036

TABLE 2.10 UNCERTAINTIES OF CORRECTION FACTORS FOR EQUATIONS USED

		mean		c.o.v.	
		A.C.I.	A.I.J.	A.C.I.	A.I.J.
Shear	Eq. 2.13	1.280		0.469	
	Eq. 2.17		1.007		0.262
Flexure	Eq. 2.18	1.098		0.125	
	Eq. 2.25-27		1.017		0.158

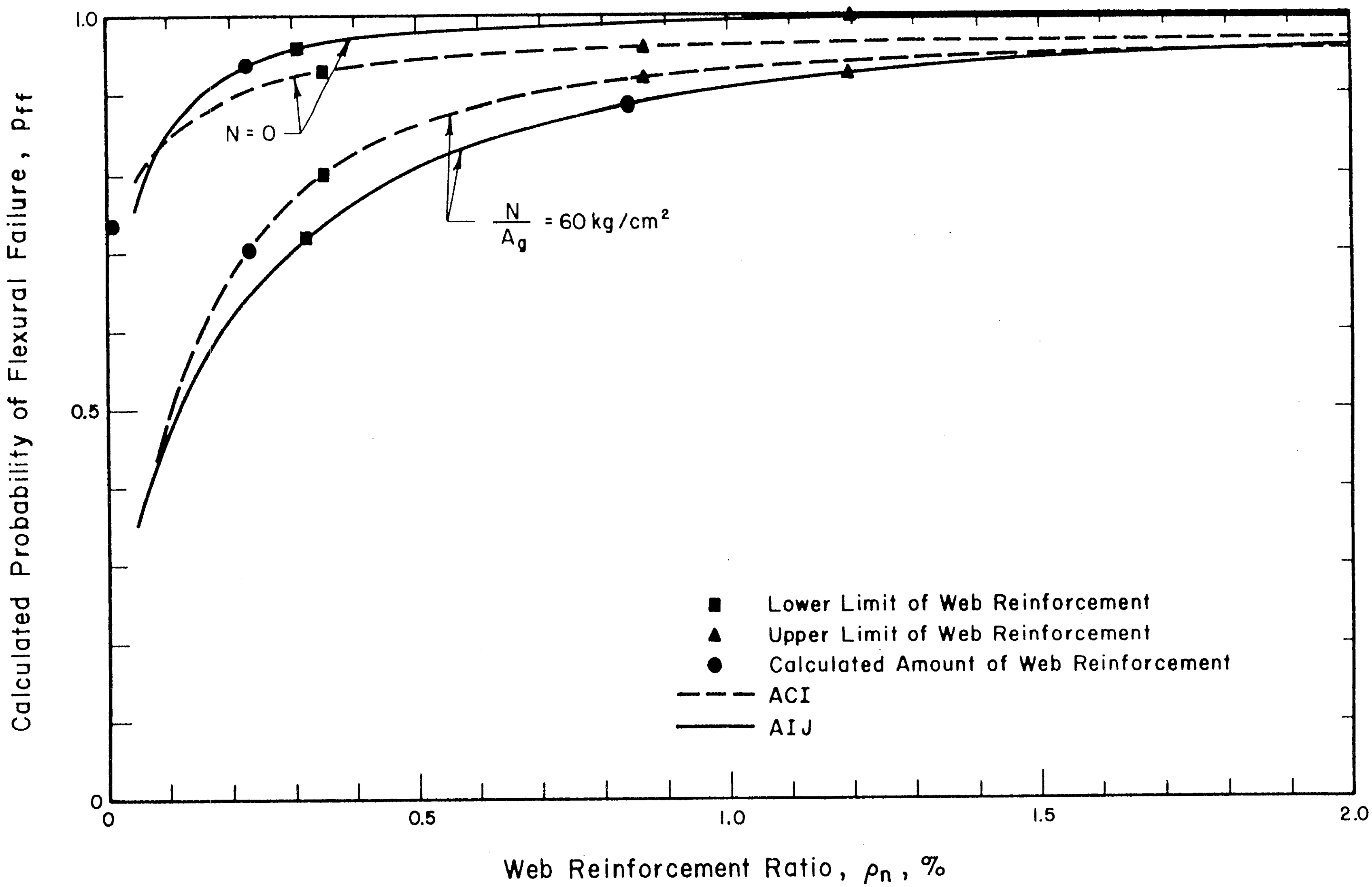


Fig. 3.1. Probability of Flexural Failure for Normal Distribution of (V_s/V_f)

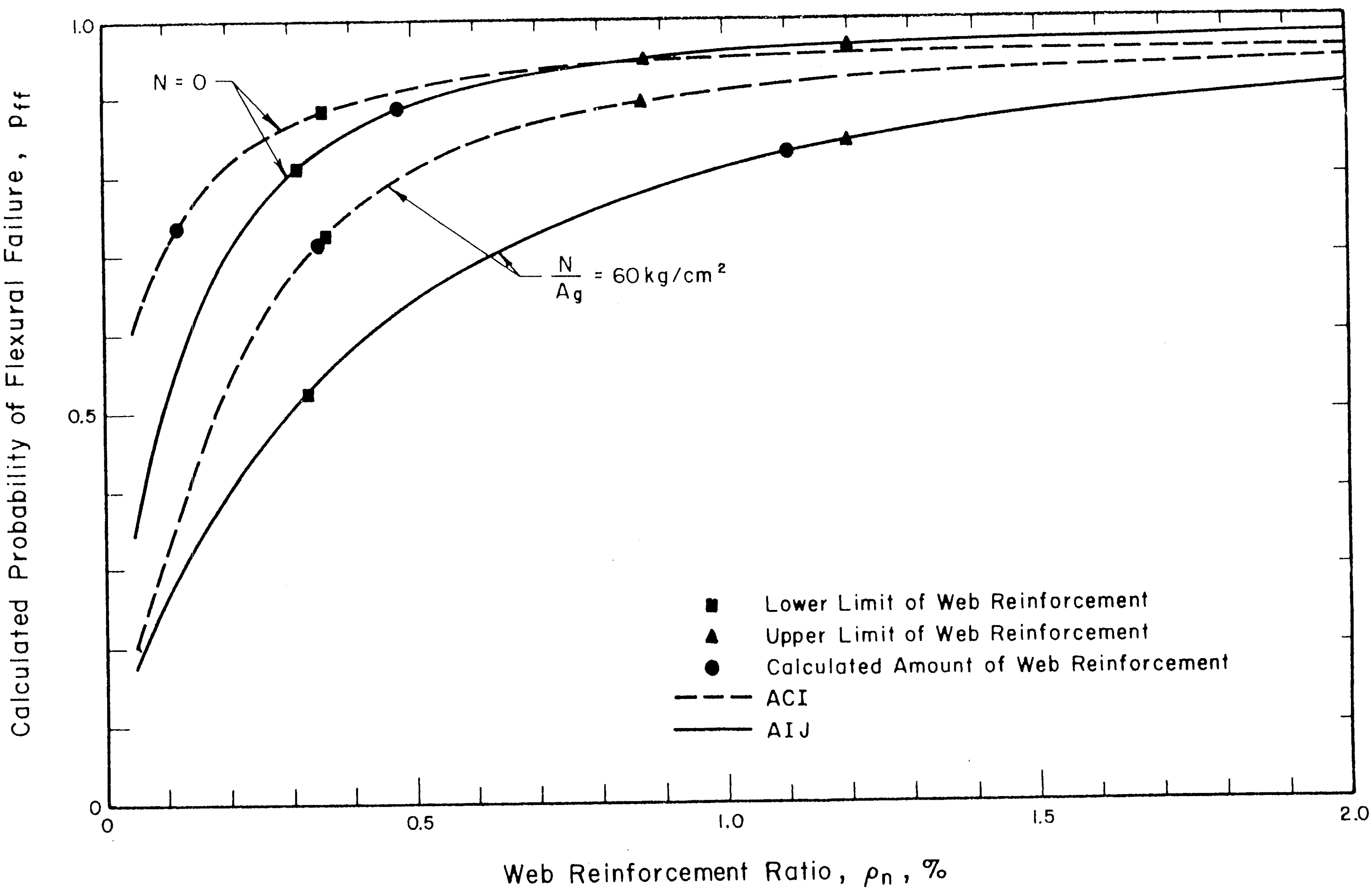


Fig. 3.2. Probability of Flexural Failure for Normal Distribution of (V_s/V_f)

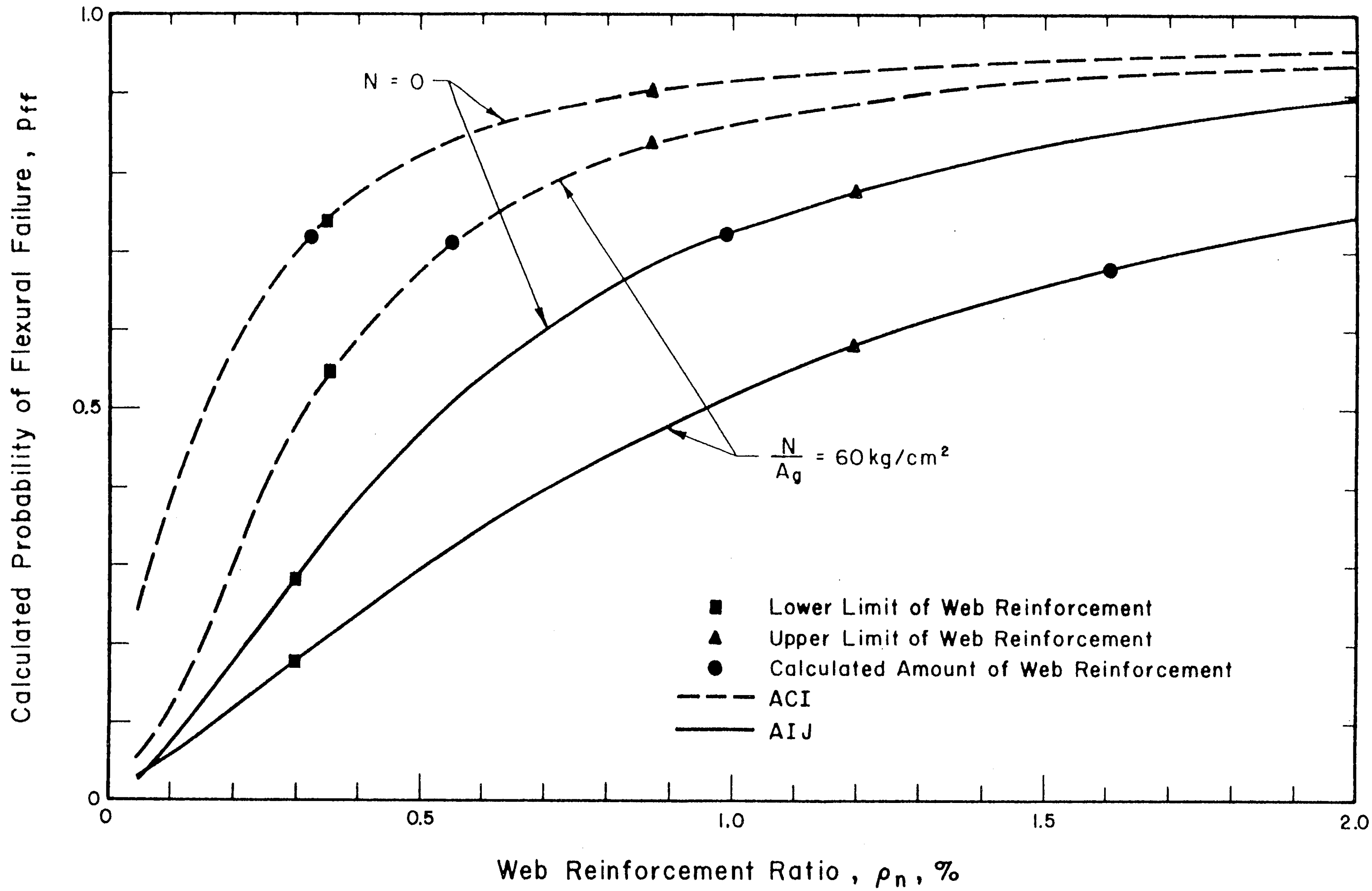


Fig. 3.3. Probability of Flexural Failure for Normal Distribution of (V_s/V_f)

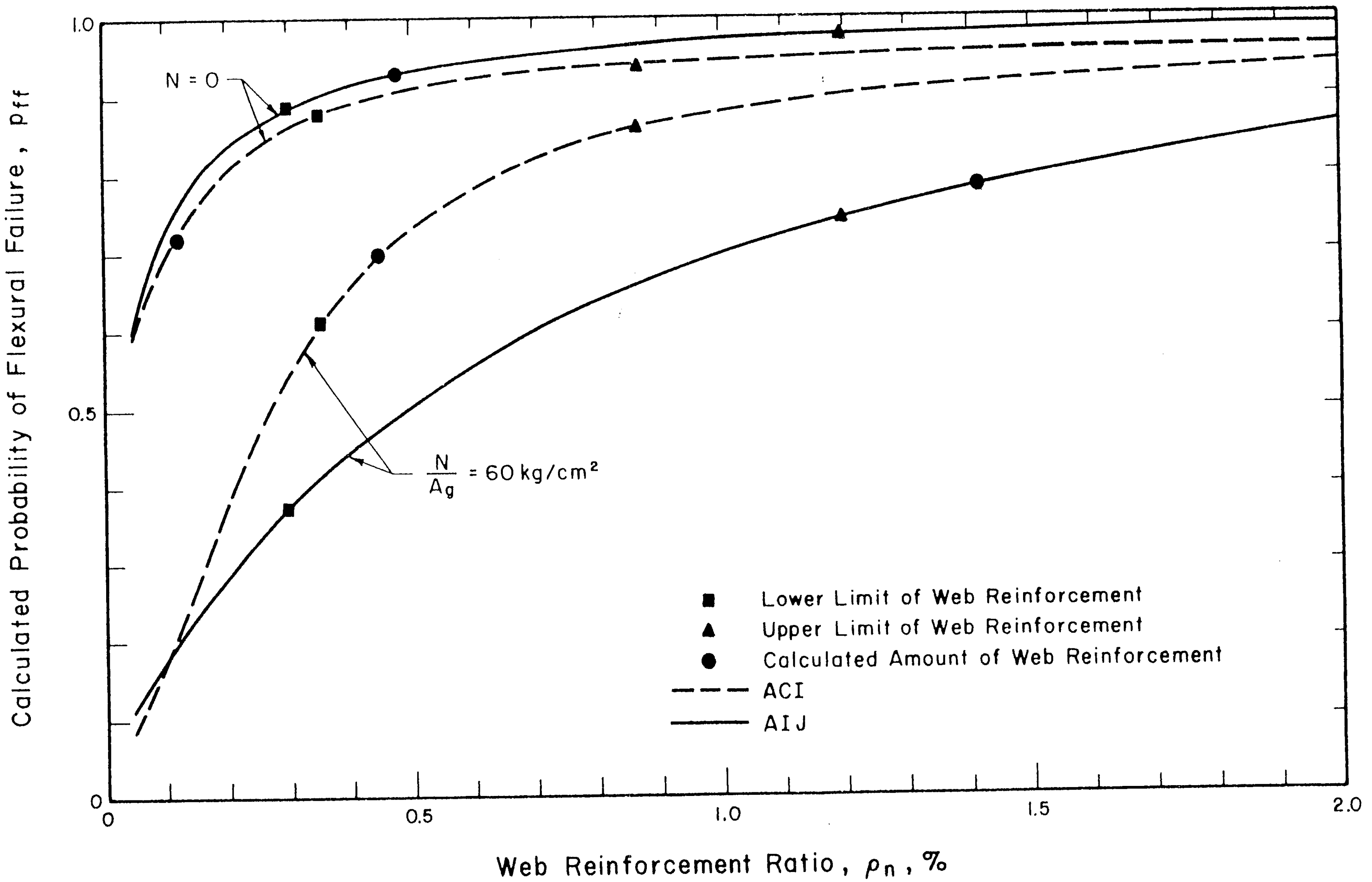


Fig. 3.4 Probability of Flexural Failure for Normal Distribution of (V_s/V_f)

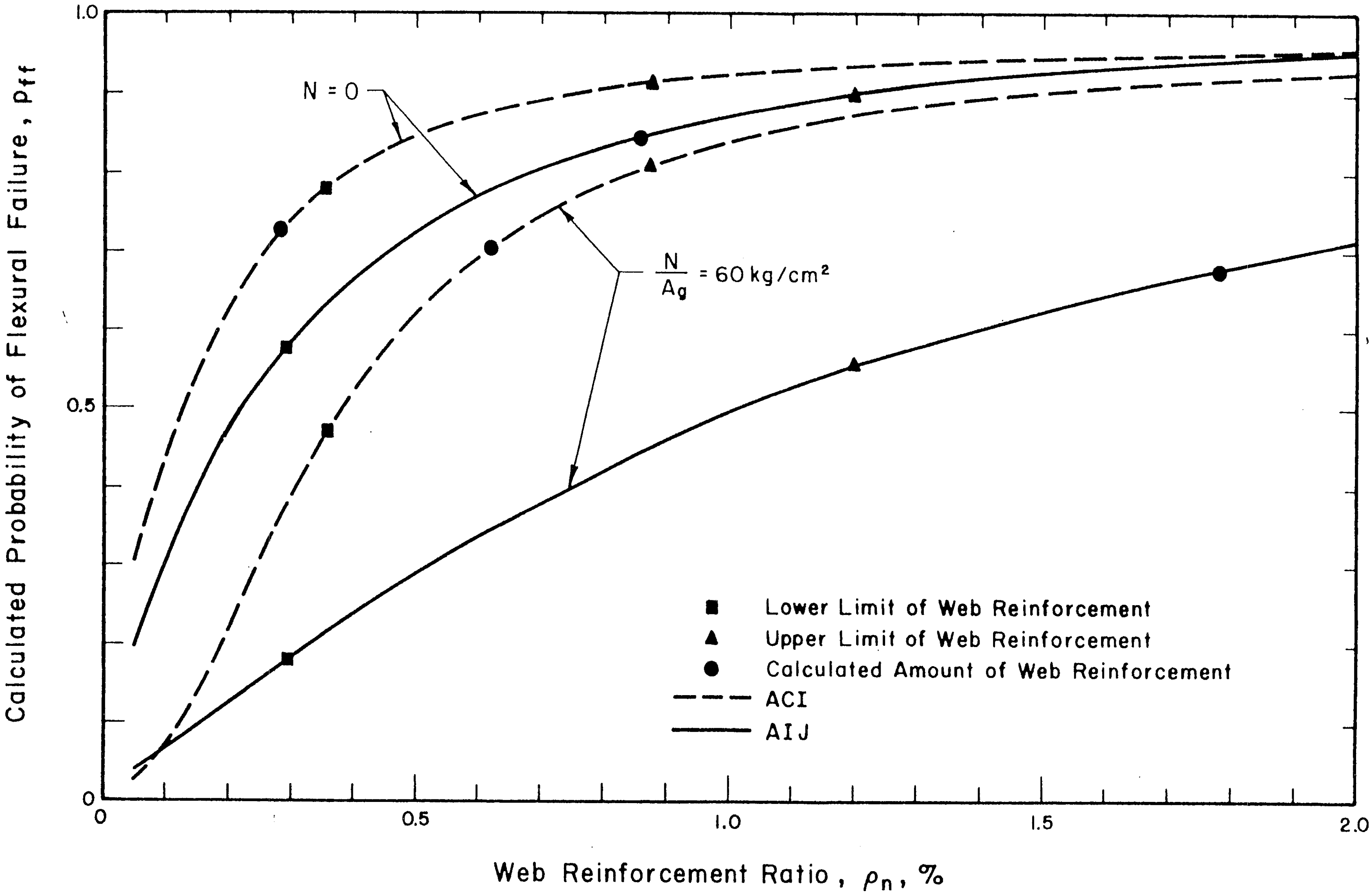


Fig. 3.5. Probability of Flexural Failure for Normal Distribution of (V_s/V_f)

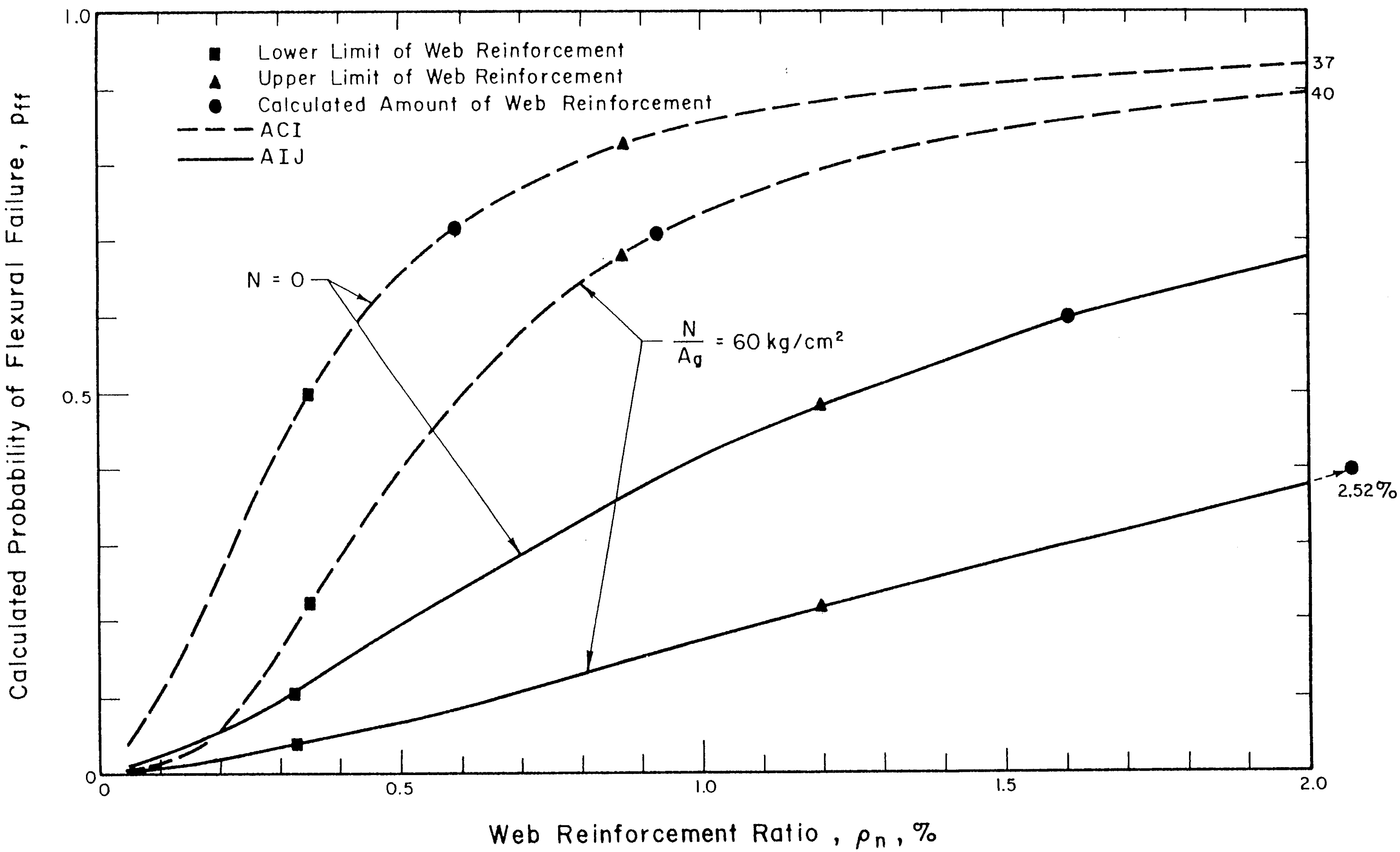


Fig. 3.6. Probability of Flexural Failure for Normal Distribution of (V_s/V_f)

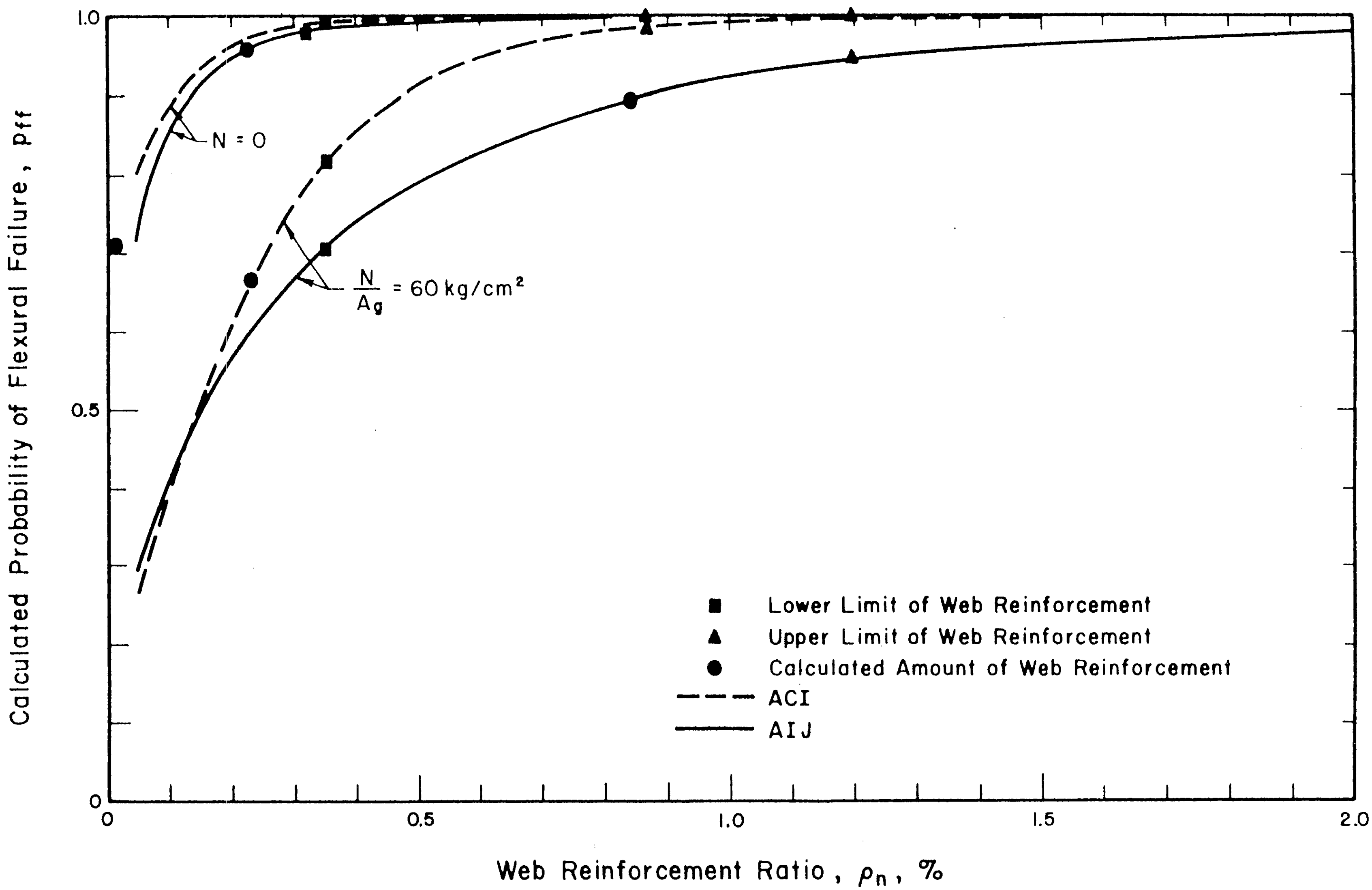


Fig. 3.7. Probability of Flexural Failure for Log-Normal Distribution of (V_s/V_f)

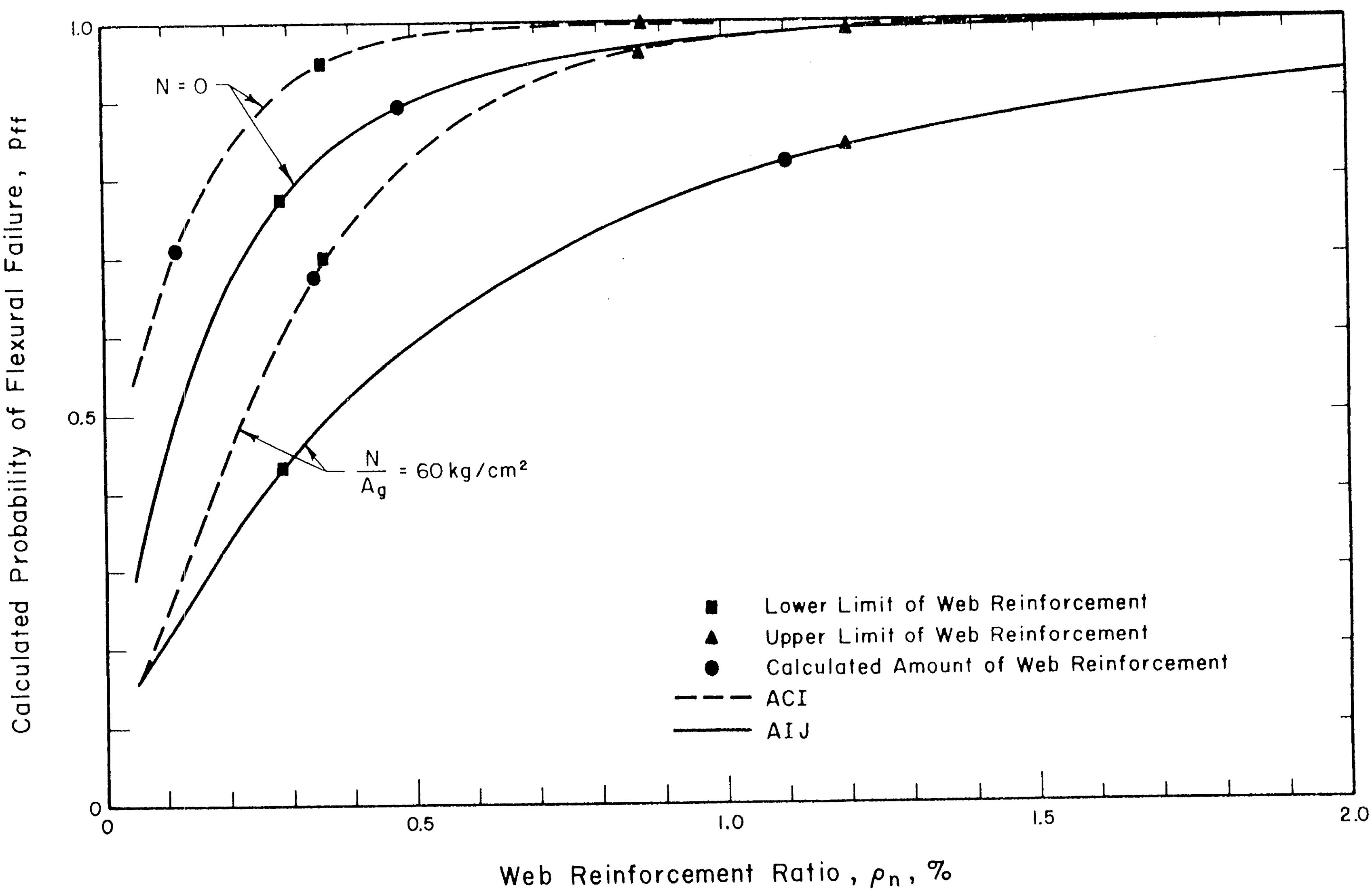


Fig. 3.8. Probability of Flexural Failure for Log-Normal Distribution of V_s/V_f)

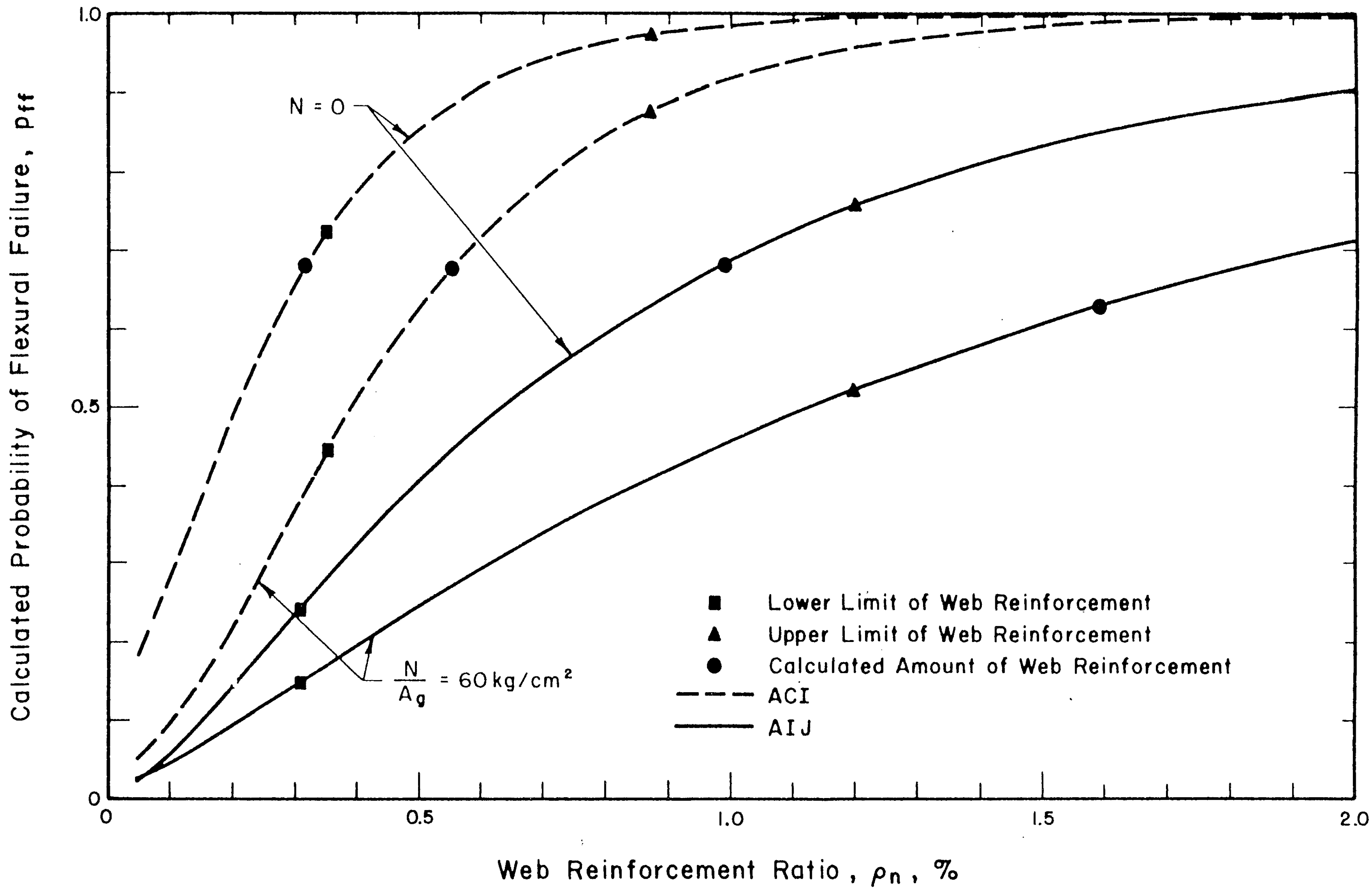


Fig. 3.9. Probability of Flexural Failure for Log-Normal Distribution of (V_s/V_f)

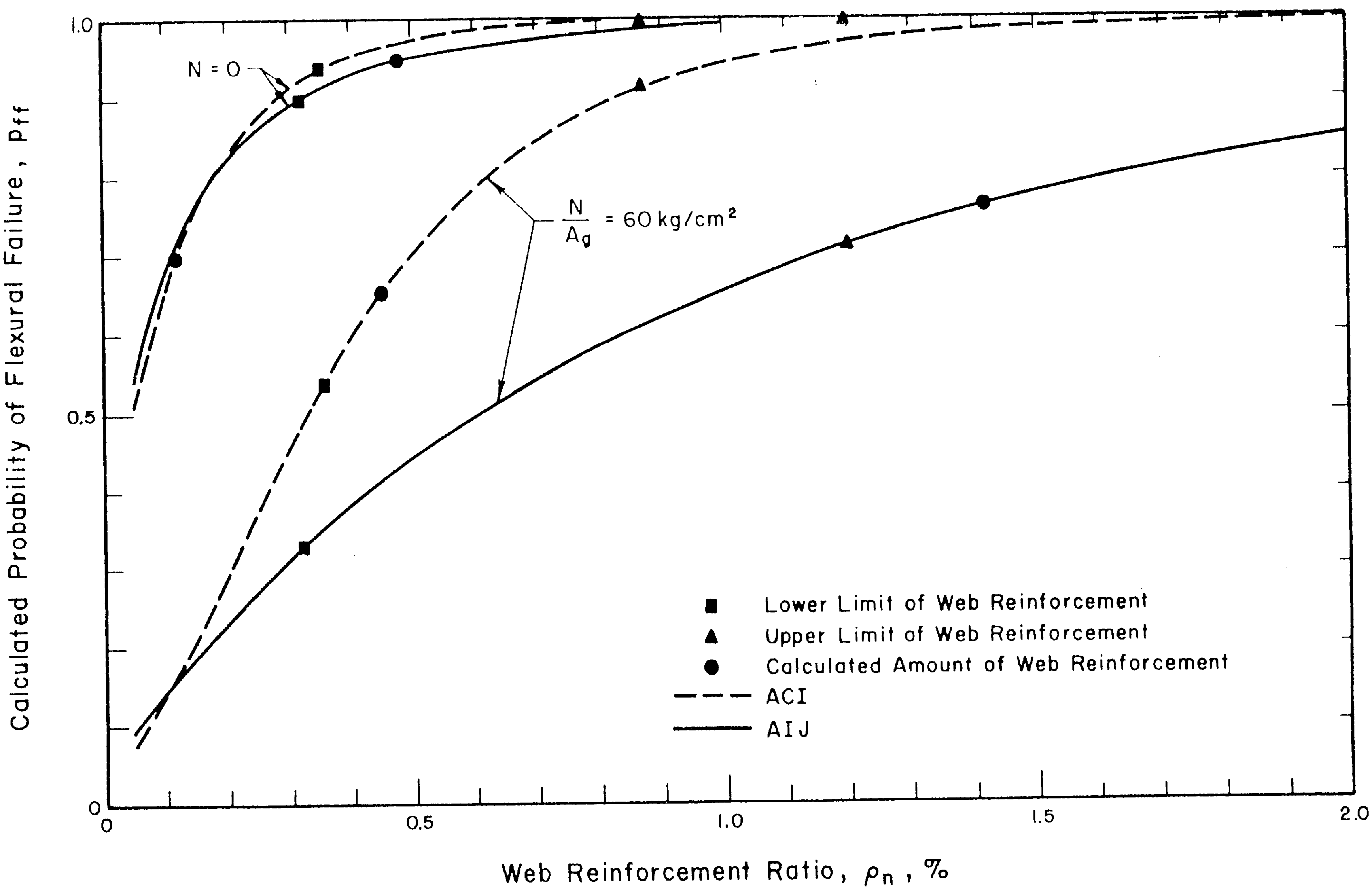


Fig. 3.10. Probability of Flexural Failure for Log-Normal Distribution of (V_s/V_f)

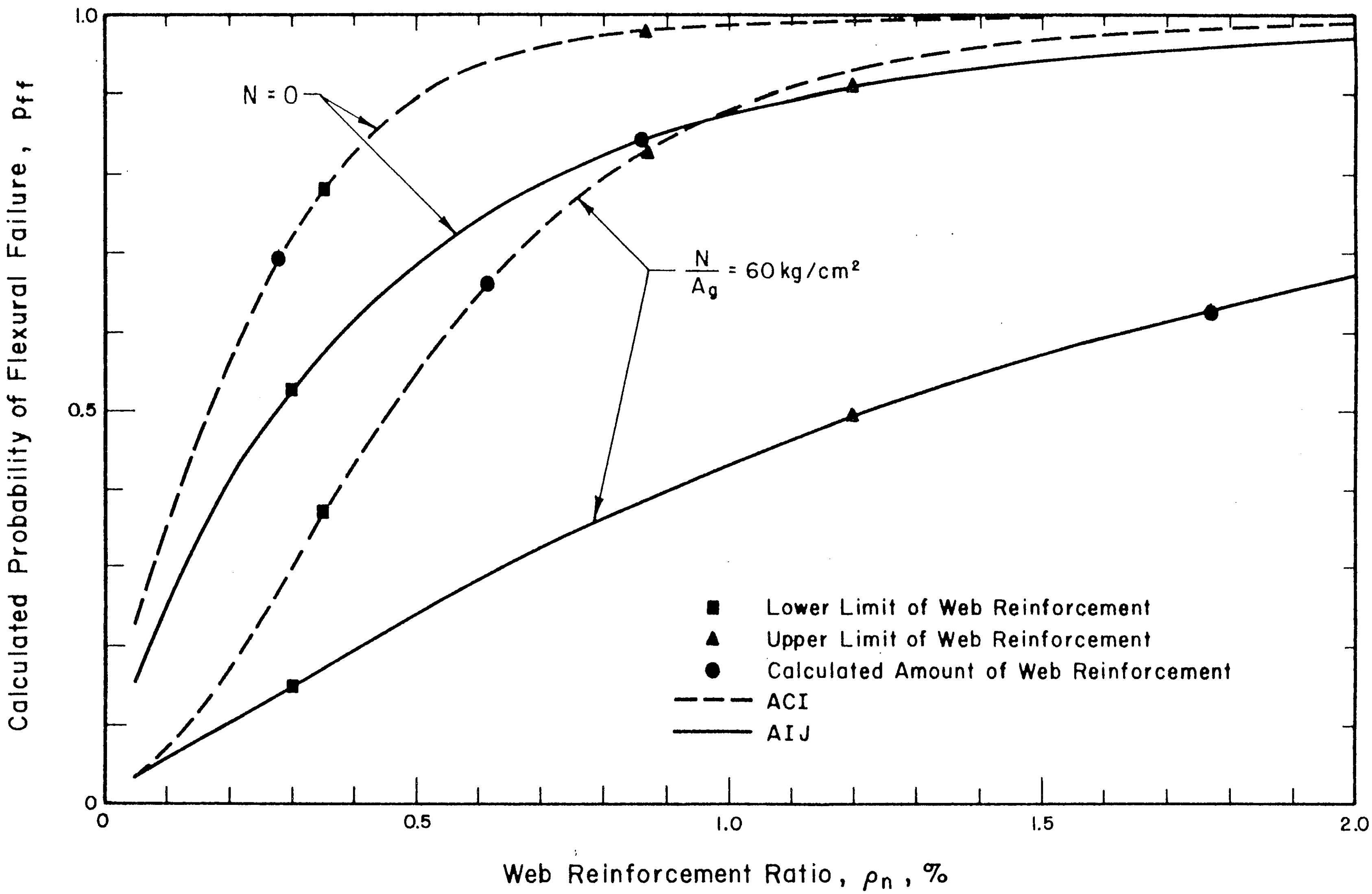


Fig. 3.11. Probability of Flexural Failure for Log-Normal Distribution of (V_s/V_f)

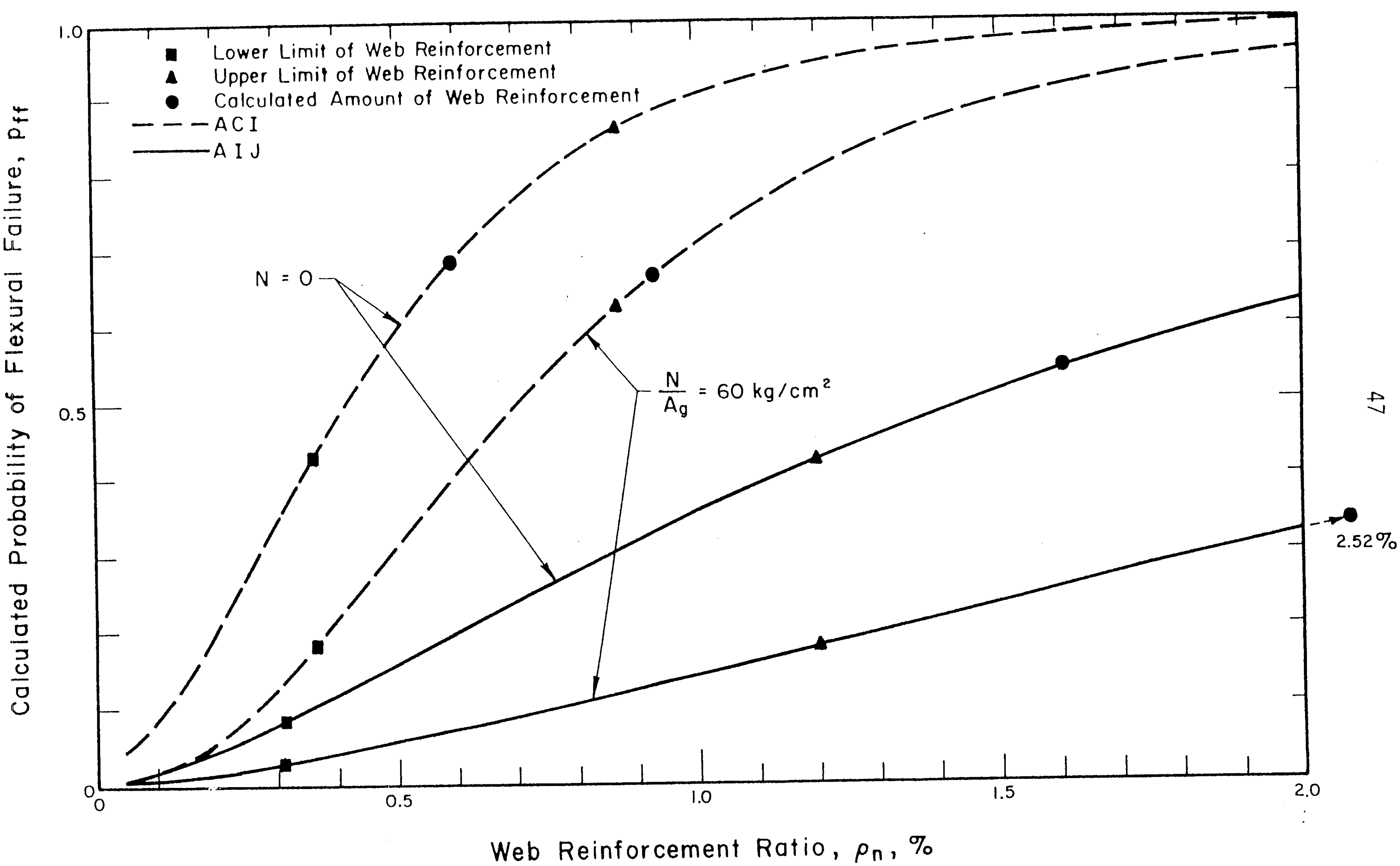


Fig. 3.12. Probability of Flexural Failure for Log-Normal Distribution of (V_s/V_f)

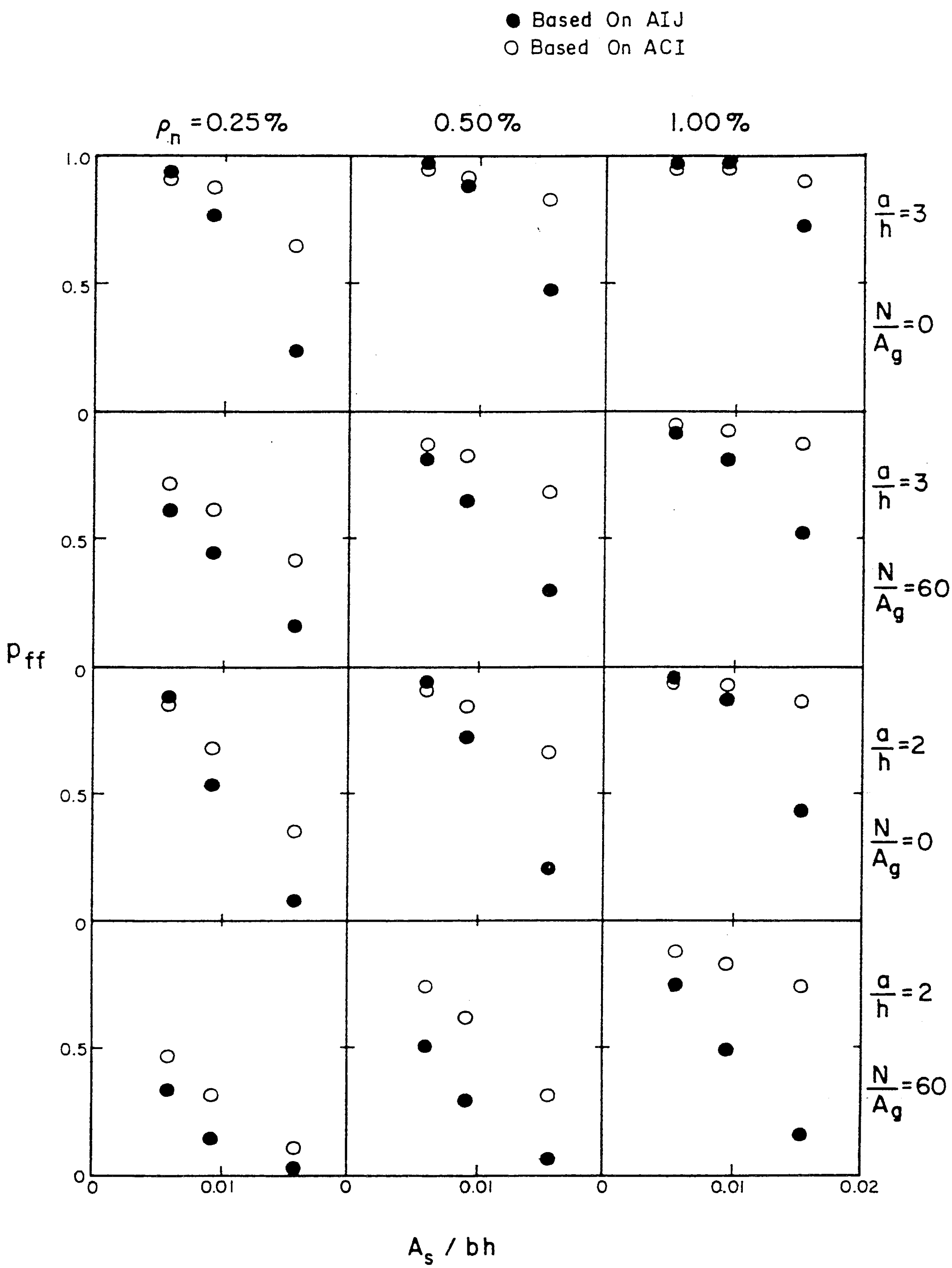


Fig. 3.13. Calculated Variation of Probability of Flexural Failure with Amount of Longitudinal Reinforcement (Normal distribution assumed for $V_s - V_f$)

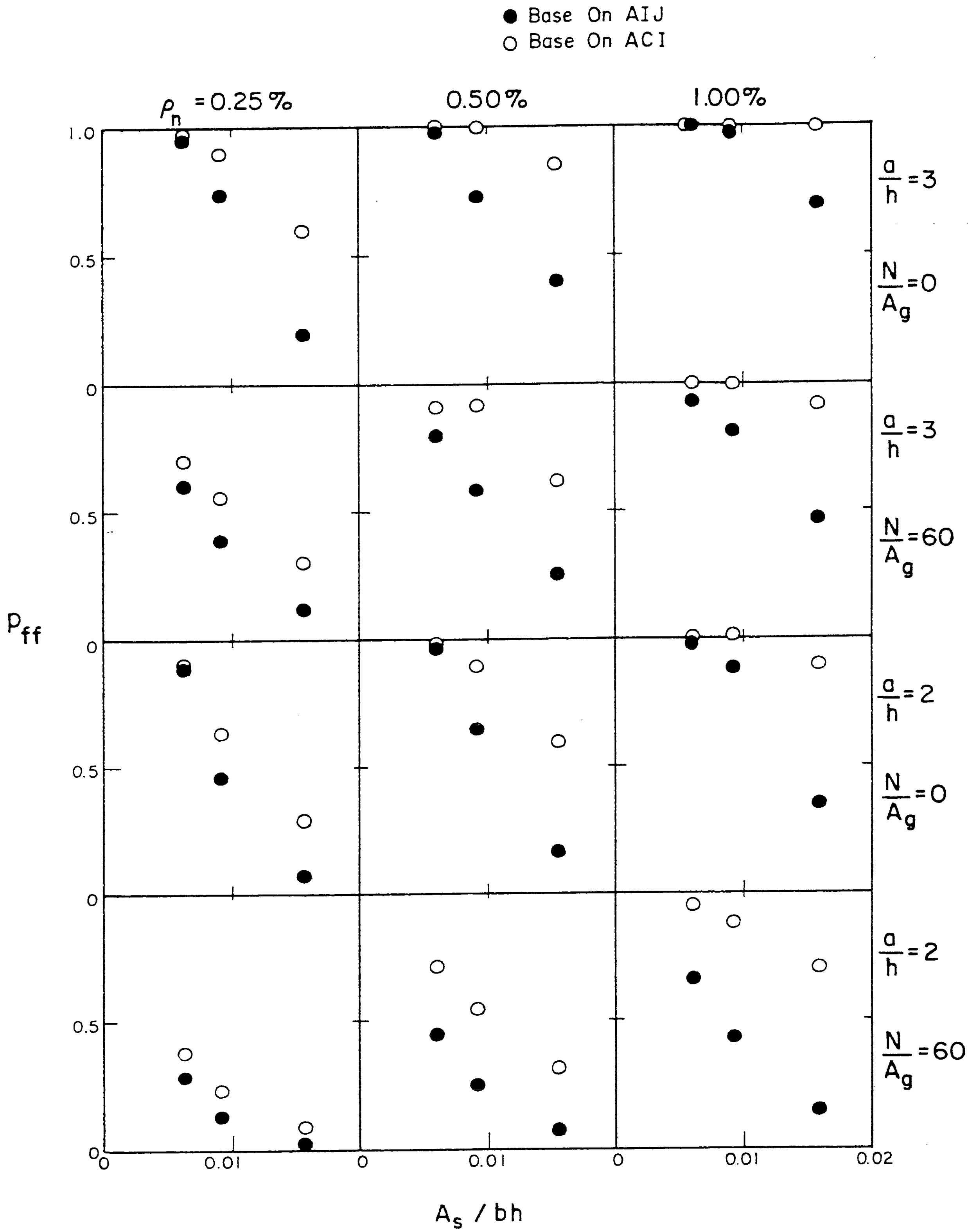


Fig. 3.14. Calculated Variation of Probability of Flexural Failure with Amount of Longitudinal Reinforcement (Lognormal distribution assumed for V_s/V_f)

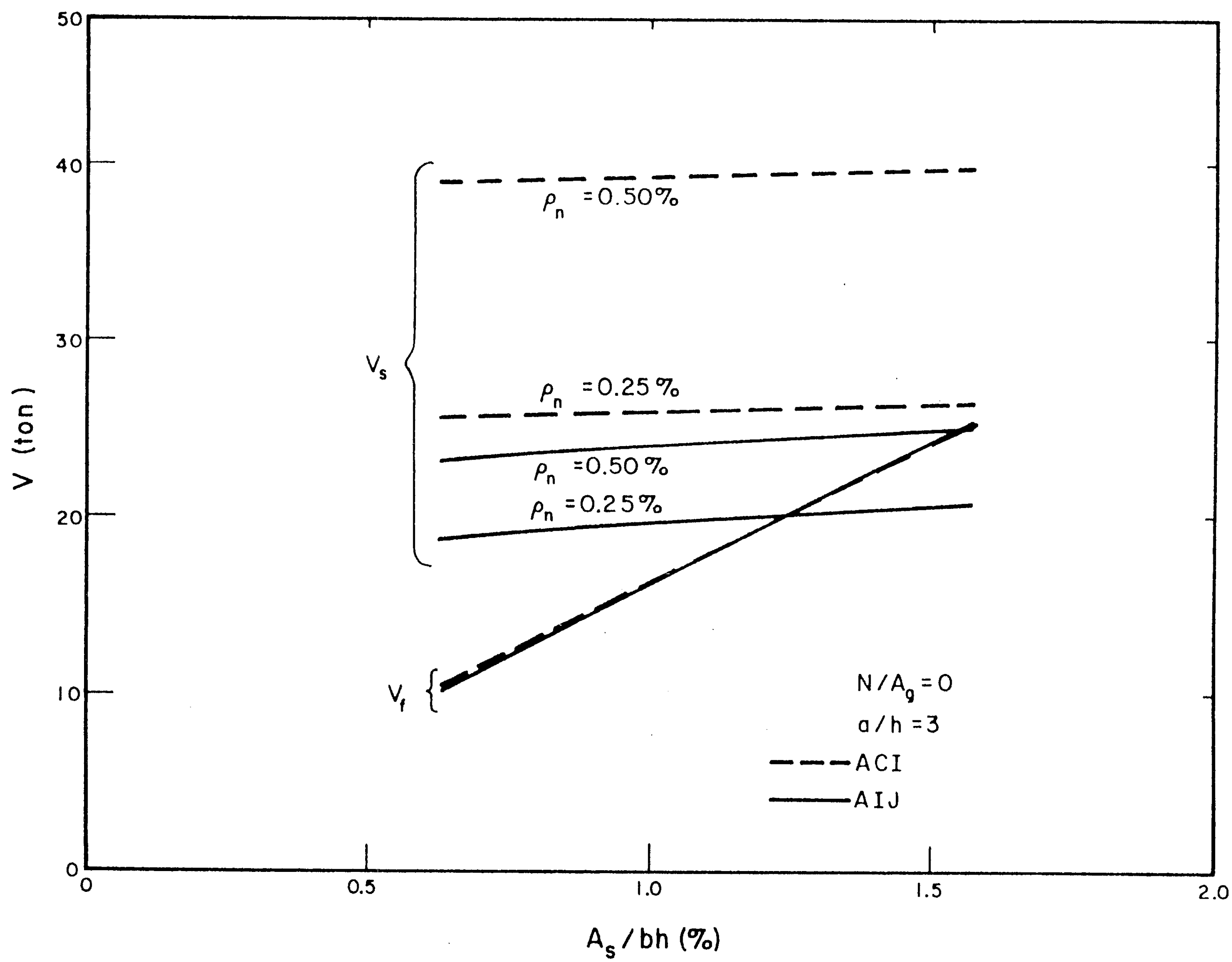


Fig. 3.15a. Variation of Calculated Design Shear Strength

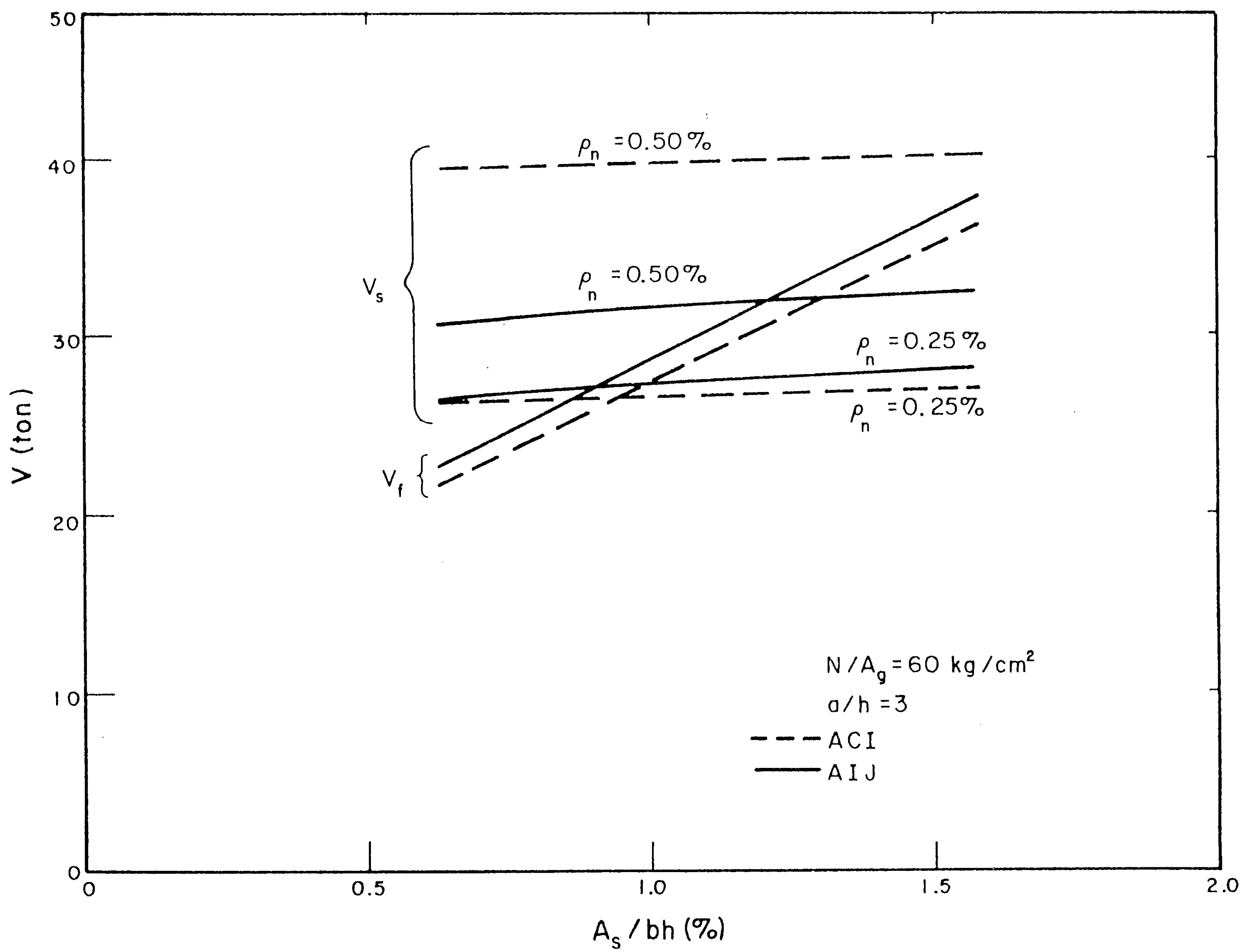


Fig. 3.15b. Variation of Calculated Design Shear Strength

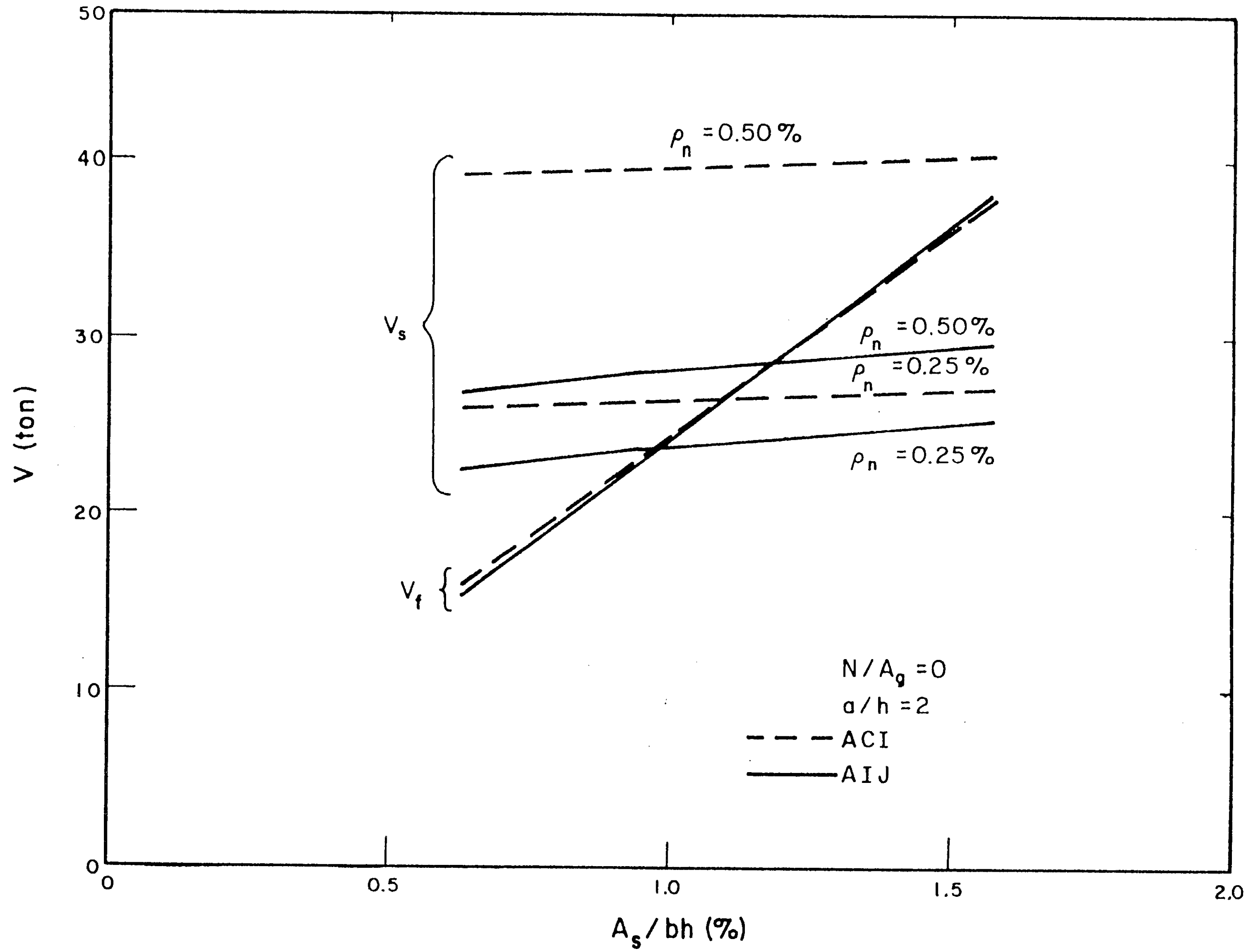


Fig. 3.15c Variation of Calculated Design Shear Strength

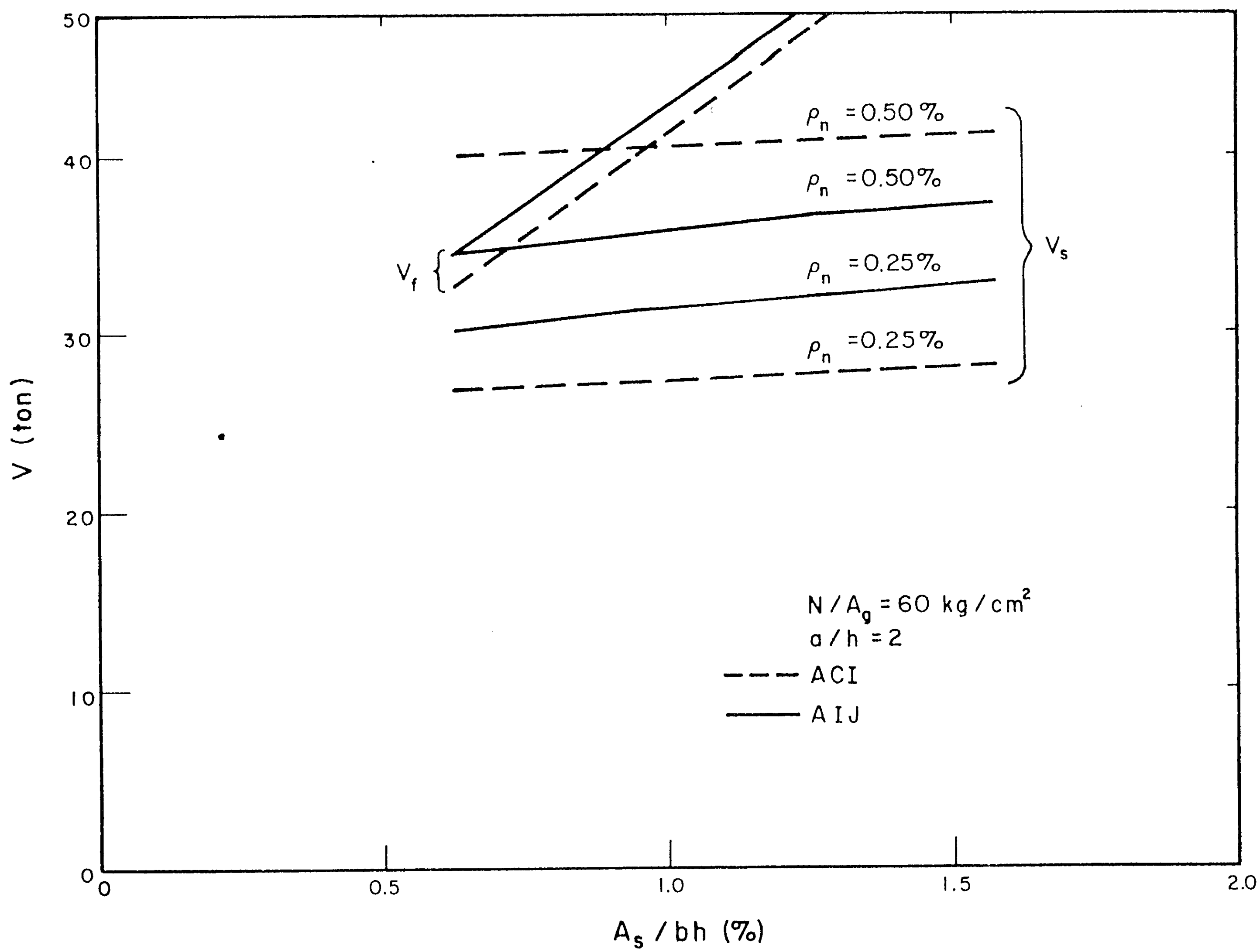


Fig. 3.15d Variation of Calculated Design Shear Strength

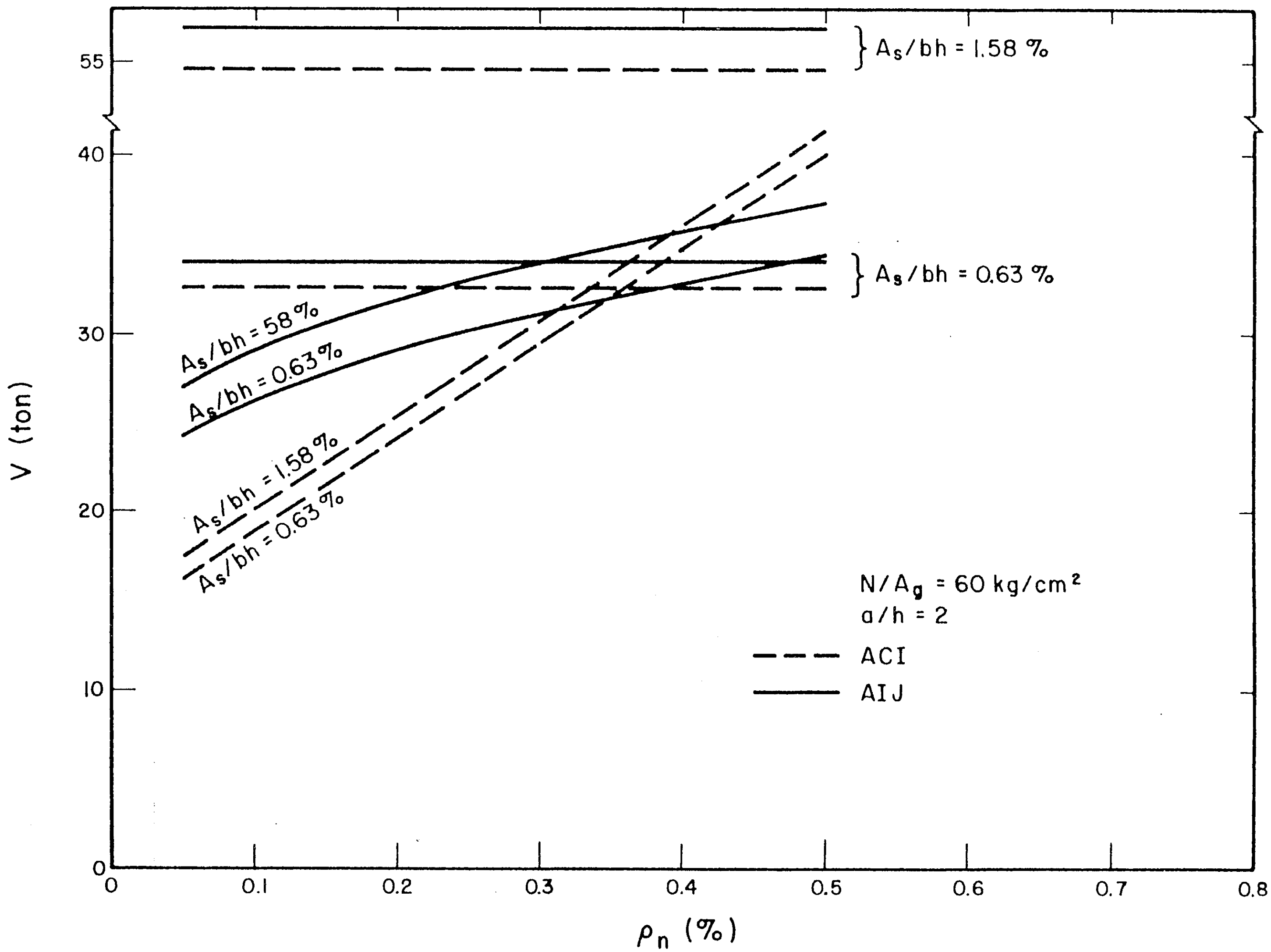


Fig. 3.16a. Variation of Calculated Design Shear Strength

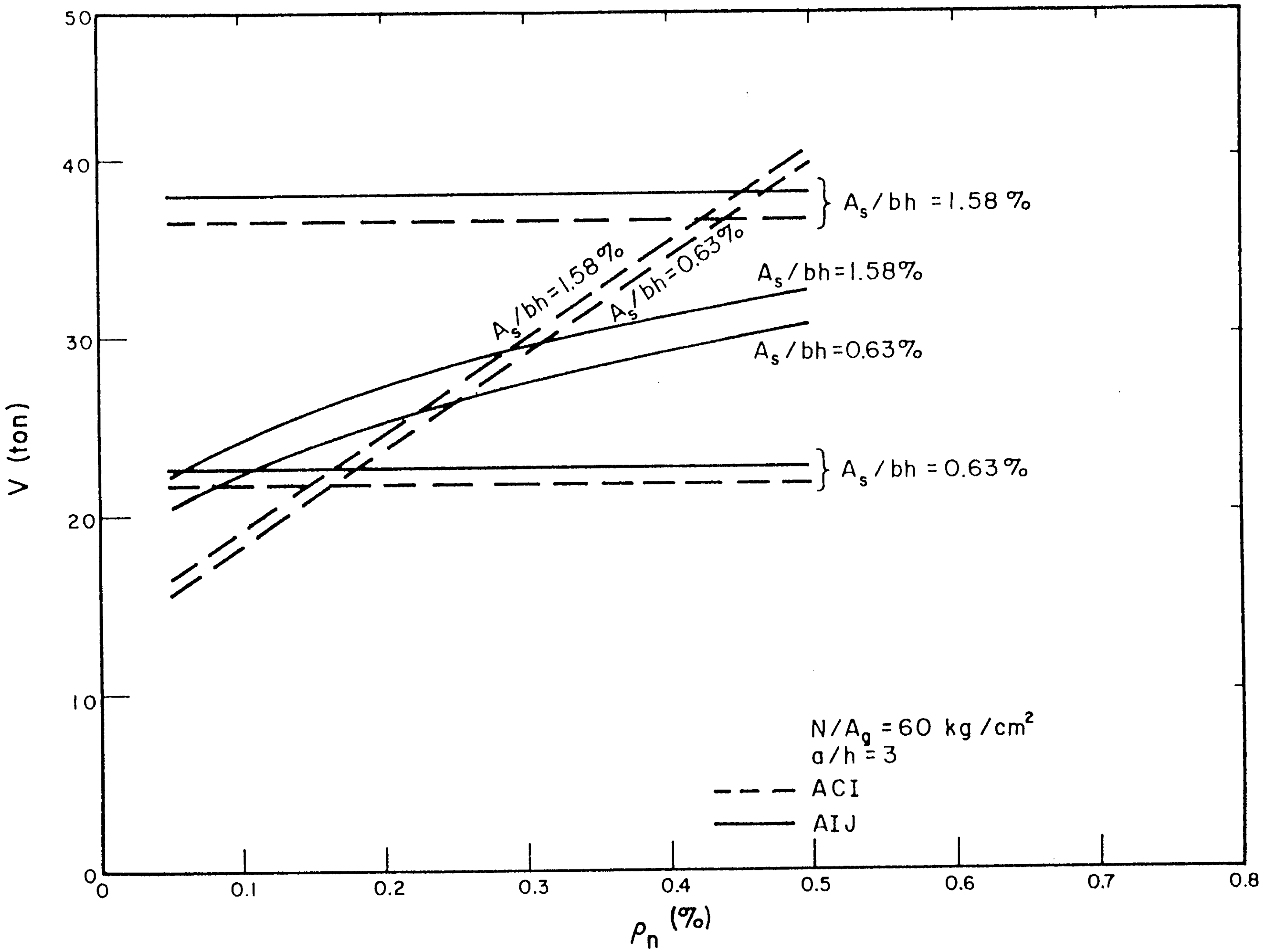


Fig. 3.16b. Variation of Calculated Design Shear Strength

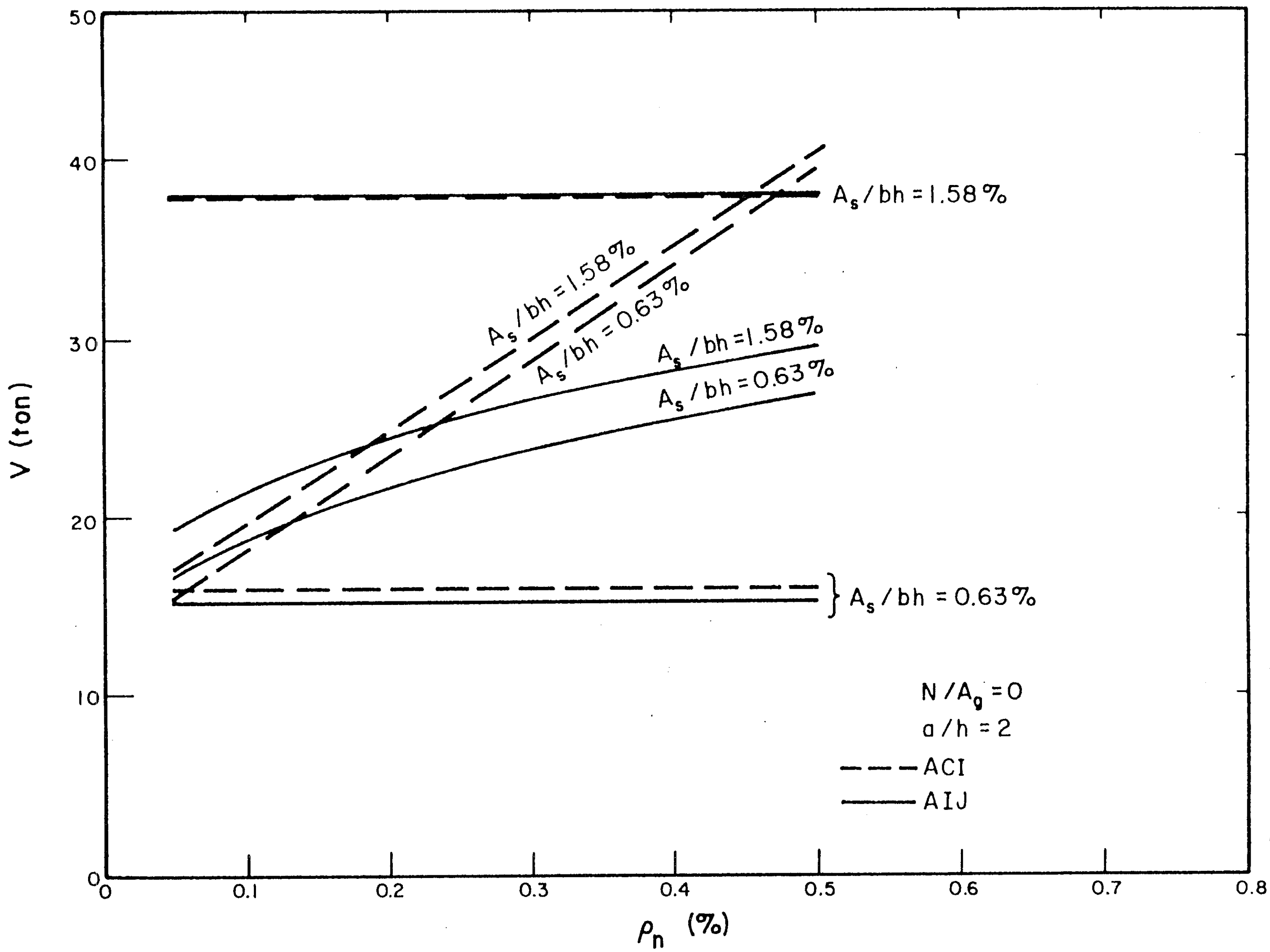


Fig. 3.16c. Variation of Calculated Design Shear Strength

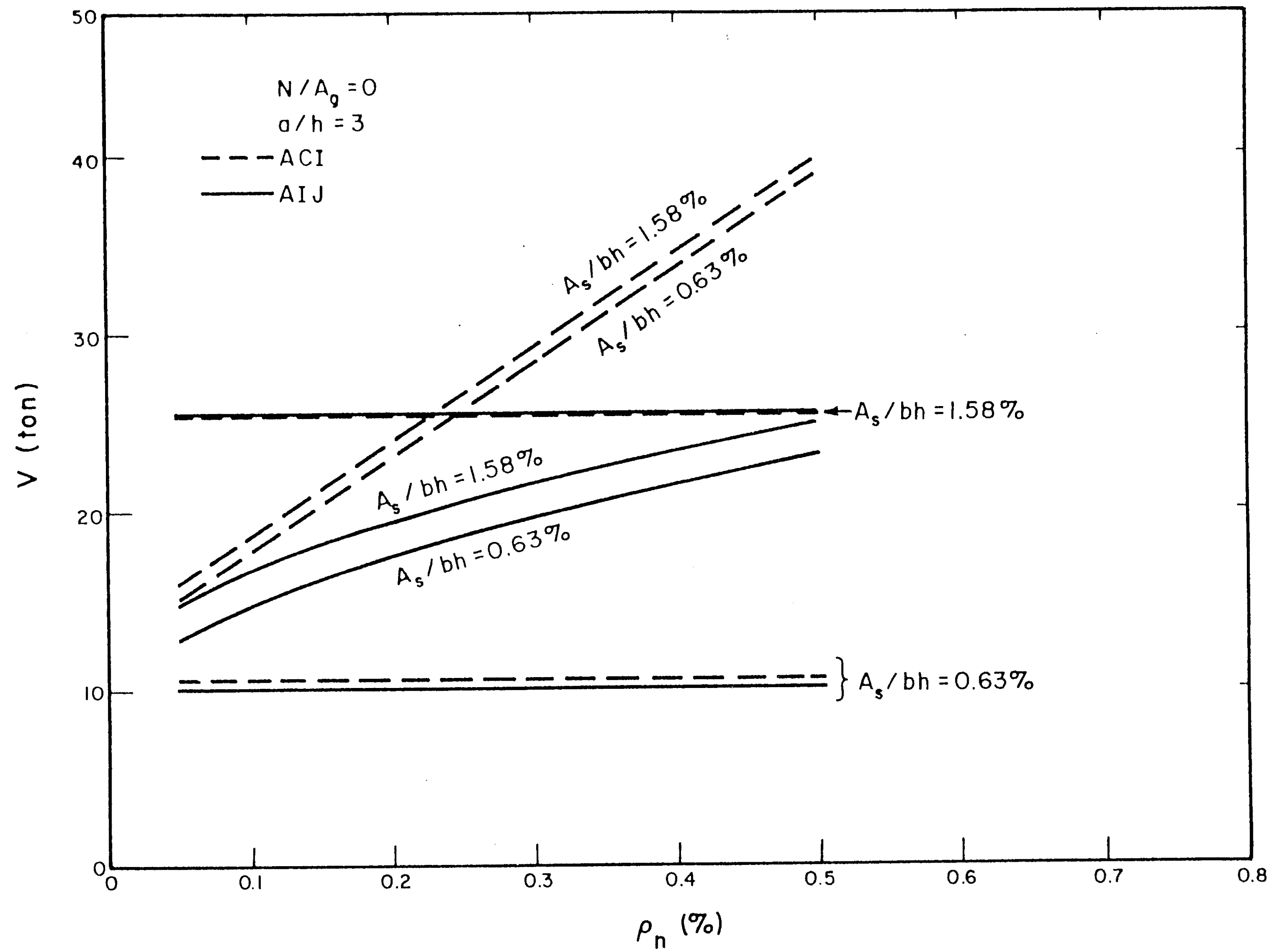


Fig. 3.16d. Variation of Calculated Design Shear Strength

APPENDIX A

DATA FROM COLUMNS TESTED IN JAPAN

Test series for columns are summarized in Table A1 and A2. Most of the data are quoted from Hirosawa's report (9), and the others are from reference 13 which is a report for the research project, "Establishment of New Aseismatic [sic] Design Method" supported by Ministry of Construction, universities and private companies.

The test series listed in Table A1 were executed as a part of the research project. In Table A2, test results collected by Hirosawa from references in Japan are summarized.

Table A3, A4 and A5 show the properties, the test results and the comparison between measured and calculated results.

Figure A1 and A2 show the various loading methods used in the tests. Figure A3 shows the typical specimens for the Ministry of Construction project. In Fig. A4, typical load deflection relationships are summarized. Typical stress-strain relationships for various types of reinforcement used in Japan are shown in Fig. A5.

Figure A6 through A10 show the distributions of variables for the overall specimens. The distributions of variables used for the estimation of equations in this study are shown in Fig. A11 through A22. Ratios of measured and calculated values for the AIJ and ACI expressions for shear strength are plotted in Fig. A23 through A26 versus web reinforcement and longitudinal reinforcement ratios.

TABLE A1 EXPERIMENTAL STUDIES COORDINATED BY THE BUILDING RESEARCH INSTITUTE, MINISTRY OF CONSTRUCTION JAPAN

Laboratory	Project Identi- fication	Mark in Table A3	Section Dimension mxm	$\frac{M}{QD}$	Concrete Comp. Strength Kg/cm^2	Number of Specimen	Major Objective
B.R.I.	PILOT	455~492	0.25 x 0.25	1.5,3.0	240,270	36	welded hoop
T.R.I. of Takenaka Komuten	LM	493~507	0.25 x 0.25	1.0,2.0	165	15	loading method
T.I.T.	LM2	508~522	0.25 x 0.25	1.0,2.0	245	15	loading method
Meiji Univ. B.R.I.	SE	523~537	0.50 x 0.50	1.0,2.0	265	15	scale effect
T.R.I. of Taisei Const. Co., Ltd.	FC	538~551	0.25 x 0.25	1.0,2.0	453	14	strength of concrete
T.R.I. of Obayashi-Gumi Co., Ltd.	WS	552~566	0.25 x 0.25	1.0,2.0	274	15	welded hoop
T.R.I. of Fujita Kogyo	AF	594~608	0.25 x 0.25	1.0,2.0	190	15	axial stress
T.M.U.	CW		0.25 x 0.25	1.0,2.0	151	10	wing wall
T.R.I. of Kashima Const. Co., Ltd.	WS2	626~640	0.25 x 0.25	1.0,2.0	270,322	15	spiral
T.D.C. of Toda Const. Co., Ltd.	LS	609~625	0.25 x 0.25	1.5,3.0	193	17	shear span ratio
T.M.U.	LE	712~721	0.25 x 0.25	2.0	240	10	loading program
M.I.T.	DWC	660~671	0.25 x 0.25	2.0,2.5, 3.0	198~244	12	spacing of web reinforcement
R.I. of Shimizu Const. Co., Ltd.	AR	672~684	0.25 x 0.25	1.5,2.0	124,153	13	arrangement of reinforcement
M.I.T.	DWC2	750~755	0.25 x 0.25	2.0,2.5, 3.0	185~217	6	spacing of web reinforcement
R.I. of Shimizu Const. Co., Ltd.	AR2	734~749	0.25 x 0.25	2.0	261	16	arrangement of reinforcement
T.M.U.	LE2	722~727	0.25 x 0.25	1.0	146	6	loading program
T.M.U.	CW2		0.25 x 0.25	1.0,2.0	187	6	wing wall
B.R.I.	NS	728~733	0.25 x 0.25	1.0,2.0	140,180	6	plain bar
B.R.I.	NS2	786~791	0.25 x 0.25	1.5,2.0	263	6	plain bar
T.M.U.	AF2	774~780	0.25 x 0.25	2.0	241	7	axial stress
T.R.I. of Obayashi-Gumi Co., Ltd.	CHT	781~785	0.40 x 0.40	1.5,2.0	240,277	5	closed hoop
B.R.I.*	KE	641~643	0.25 x 0.25	2.0	210	3	shape of hoop
M.I.T.*	ARA1	685~711	0.25 x 0.25	1.0,1.5, 2.0	203~264	27	ties
M.I.T.*	ARA2	756~773	0.25 x 0.25	2.0,2.5, 3.0	209~246	18	shape of hoop

* parallel investigations
M = maximum moment
Q = shear
D = overall depth of section

B.R.I. = Building Research Institute, Ministry of Construction
T.I.T. = Tokyo Institute of Technology
T.M.U. = Tokyo Metropolitan University
M.I.T. = Muroran Institute of Technology
T.R.I. = Technical Research Institute
R.I. = Research Institute
T.D.C. = Technical Development Center

TABLE A2. MISCELLANEOUS EXPERIMENTAL STUDIES CARRIED OUT IN JAPAN

Investigator	Mark in Table A4	Section Dimension m*m	$\frac{M}{QD}$	Concrete Comp. Strength Kg/cm^2	Number of Specimens	Major Variables
M. Wakabayashi K. Minami	1 ~ 40	0.10x0.15	3.0	287-402	40	ρ_n, σ_o
A. Ikeda	41 - 58	0.20x0.20	2.5	200	18	ρ, ρ_n, σ_o
A. Ikeda	59 - 66	0.20x0.20	2.5	200	8	ρ, ρ_n, σ_o
A. Ikeda	67 - 74	0.20x0.20	2.5	210	8	ρ, σ_o
A. Ikeda	75 - 78	0.20x0.20	2.5	230	4	σ_o
S. Kokusho	79 - 82	0.20x0.20	2.5	219	4	ρ
M. Hirosawa	83 - 89	0.20x0.20	2.5	213	7	ρ, ρ_n, σ_o
M. Hirosawa	90 - 96	0.20x0.20	2.5	228	7	ρ, ρ_n, σ_o
A. Ikeda	97-103	0.20x0.20	2.5	267	7	ρ, ρ_n, σ_o
A. Ikeda	104-110	0.20x0.20	2.5	297	7	ρ, ρ_n, σ_o
T. Takeda K. Yoshioka	111-125	0.30x0.30	2.3	201-223	15	ρ_n, σ_o
T. Takeda K. Yoshioka	126-140	0.30x0.30	1.5	187-226	15	ρ_n, σ_o
Y. Suenaga	141-171	0.12x0.12	2.0,3.0, 4.0	124-241	31	M/QD, ρ_n
Y. Suenaga	172-177	0.12x0.12	3.0	238	6	
M. Ozaki M. Hirosawa	178-195	0.40x0.60	1.0	144-253	18	ρ_n
T. Hisada S. Bessho	196-204	0.35x0.35	2.1	358-377	9	ρ_n
H. Umemura T. Endo	205-216	0.20x0.20	2.0,3.0	180	12	ρ_n, σ_o
H. Umemura T. Endo	217-228	0.20x0.20	2.0,3.0	336	12	ρ_n
H. Umemura Y. Fukada	229-234	0.20x0.20	2.0	134-151	6	
H. Umemura S. Nakata	235-238	0.25x0.50	1.0,2.0	134-146	4	
A. Ikeda	239-262	0.15x0.15	2.3	215-248	24	M/QD, ρ_n, σ_o
A. Ikeda	263-278	0.15x0.15	2.3	200-206	16	M/QD
M. Yamada	279-282	0.16x0.16	1.0	202	4	ρ_n
M. Yamada	283-288	0.16x0.16	1.0-4.0	291-360	6	M/QD, σ_o
M. Yamada	289-304	0.16x0.16	0.53-2.1	197-291	16	M/QD, σ_o
K. Ohshima Y. Sonobe	305-314	0.20x0.30	4.0	210-311	10	ρ
Y. Sonobe K. Ishibashi	315-320	0.20x0.30	4.0	428	6	ρ
H. Umemura H. Noguchi	335-342	0.25x0.50	1.0	127-146	8	ρ_n
S. Kokusho E. Yoshizumi	343-369	0.20x0.20	1.5	210	27	ρ_n
S. Kokusho	372-377	0.20x0.20	2.5	203-243	6	ρ, ρ_n
H. Umemura S. Kokusho	378-387	0.20x0.20	2.5	228-340	10	σ_o
T. Naka	388-446	0.15x0.20	1.25,2.50, 3.95	163-381	59	M/QD, ρ, ρ_n, σ_o
S. Kokusho M. Fukuhara	447-454	0.20x0.20	1.25,2.50, 3.95	224	8	ρ

M = maximum moment
Q = shear
D = overall depth of section

ρ = longitudinal reinforcement ratio
ρ_n = web reinforcement ratio
σ_o = axial stress

LEGEND FOR TABLE A3

(1) mark

(2) b: width (m)

(3) h: overall depth (m)

(4) d': concrete cover plus half bar diameter (m)

(5) M/QD: "moment/shear" ratio compared with total section depth, where M = maximum moment, Q = shear

(6) M/Qd: "moment/shear" ratio compared with effective depth, where d = effective depth

(7) : longitudinal reinforcement ratio (%)

(8) $_{n}$: web reinforcement ratio (%)

(9) f'_c: concrete compressive strength (kg/cm^2)

(10) f_y: yield stress of longitudinal reinforcement (ton/cm^2)

(11) type of longitudinal reinforcement, 1 refers to SD35, 2 refers to SR24, 3 refers to SD30 and 4 refers to SD40 and others.

(12) f_{yn}: yield stress of web reinforcement (ton/cm^2)

(13) type of web reinforcement, 1 refers to SD35, 2 refers to SR24, 3 refers to SD30 and 4 refers to SD40 and others

(14) N/A_g: axial stress (kg/cm^2)

(15) loading method 1, W: WAKABAYASHI, S: SIMPLE SUPPORTS, O: OHNO, T: TSUBOI, K: KENKEN

(16) loading method 2, 1: one way loading, 2: repeat loading

(17) loading method 3, M: monotonically increasing loading, R: less than 5 cycles, E: more than 6 cycles

(18) type of concrete, 1: normal weight concrete, 2-4: light weight concrete

TABLE A3-1

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
1	.10	.15	.023	.50	.59	1.40	0.00	303.	3.98	1	0.00	0	0.0	W	1	M	1
2	.10	.15	.023	.99	1.17	1.40	0.00	290.	4.00	1	0.00	0	0.0	W	1	M	1
3	.10	.15	.023	1.99	2.35	1.40	0.00	322.	3.83	1	0.00	0	0.0	W	1	M	1
4	.10	.15	.023	2.98	3.52	1.42	0.00	324.	3.88	1	0.00	0	0.0	W	1	M	1
5	.10	.15	.023	.50	.59	1.39	0.00	296.	3.99	1	0.00	0	129.0	W	1	M	1
6	.10	.15	.023	1.00	1.18	1.40	0.00	287.	3.91	1	0.00	0	130.0	W	1	M	1
7	.10	.15	.023	2.00	2.36	1.41	0.00	302.	3.98	1	0.00	0	132.0	W	1	M	1
8	.10	.15	.023	3.00	3.54	1.41	0.00	311.	3.96	1	0.00	0	132.0	W	1	M	1
9	.10	.15	.023	.50	.59	1.38	.17	333.	3.95	1	3.89	2	0.0	W	1	M	1
10	.10	.15	.023	1.00	1.18	1.41	.17	335.	3.97	1	3.89	2	0.0	W	1	M	1
11	.10	.15	.023	1.99	2.35	1.40	.17	325.	4.09	4	3.89	2	0.0	W	1	M	1
12	.10	.15	.023	3.00	3.54	1.40	.17	359.	3.74	1	3.89	2	0.0	W	1	M	1
13	.10	.15	.023	.50	.59	1.43	.17	336.	3.92	1	3.89	2	133.0	W	1	M	1
14	.10	.15	.023	1.00	1.18	1.41	.17	333.	3.88	1	3.89	2	132.0	W	1	M	1
15	.10	.15	.023	1.99	2.35	1.39	.17	342.	3.84	1	3.48	2	129.0	W	1	M	1
16	.10	.15	.023	3.00	3.54	1.41	.17	319.	3.83	1	3.48	2	132.0	W	1	M	1
17	.10	.15	.023	.50	.59	1.40	0.00	402.	4.00	4	0.00	0	0.0	W	2	E	1
18	.10	.15	.023	1.00	1.18	1.41	0.00	386.	3.92	1	0.00	0	0.0	W	2	E	1
19	.10	.15	.023	2.00	2.36	1.41	0.00	405.	3.84	1	0.00	0	0.0	W	2	E	1
20	.10	.15	.023	3.00	3.54	1.41	0.00	380.	4.10	4	0.00	0	0.0	W	2	R	1
21	.10	.15	.023	1.99	2.35	1.39	.17	388.	3.84	1	3.48	2	0.0	W	1	M	1
22	.10	.15	.023	2.00	2.36	1.40	.17	391.	3.95	1	3.48	2	0.0	W	2	E	1
23	.10	.15	.023	2.00	2.36	1.40	.17	387.	3.94	1	3.48	2	163.0	W	1	M	1
24	.10	.15	.023	2.00	2.36	1.40	.17	380.	3.94	1	3.48	2	163.0	W	2	R	1
25	.10	.15	.023	2.00	2.36	1.41	.34	379.	3.86	1	3.48	2	151.0	W	1	M	1
26	.10	.15	.023	2.00	2.36	1.41	.34	390.	3.84	1	3.48	2	151.0	W	2	E	1
27	.10	.15	.023	2.00	2.36	1.39	.33	361.	3.79	1	3.45	2	226.0	W	1	M	1
28	.10	.15	.023	2.00	2.36	1.41	.34	385.	3.92	1	3.40	2	231.0	W	2	R	1
29	.10	.15	.023	3.02	3.57	1.41	.17	375.	3.96	1	3.40	2	0.0	W	2	E	1
30	.10	.15	.023	3.00	3.54	1.40	.33	367.	4.03	4	3.53	2	0.0	W	1	M	1
31	.10	.15	.023	3.00	3.54	1.39	.33	365.	4.21	4	3.53	2	0.0	W	2	R	1
32	.10	.15	.023	3.00	3.54	1.40	.33	375.	3.99	1	3.48	2	0.0	W	1	M	1
33	.10	.15	.023	3.00	3.54	1.43	.34	381.	4.00	4	3.48	2	0.0	W	2	R	1
34	.10	.15	.023	2.98	3.52	1.40	.34	379.	4.07	4	3.48	2	0.0	W	2	E	1
35	.10	.15	.023	3.00	3.54	1.40	.17	379.	3.83	1	3.45	2	150.0	W	1	M	1
36	.10	.15	.023	3.00	3.54	1.43	.17	386.	3.83	1	3.53	2	153.0	W	2	R	1
37	.10	.15	.023	3.00	3.54	1.40	.17	406.	3.84	1	3.53	2	150.0	W	2	E	1
38	.10	.15	.023	3.00	3.54	1.41	.34	347.	3.83	1	3.53	2	132.0	W	1	M	1
39	.10	.15	.023	3.00	3.54	1.40	.33	338.	3.84	1	3.45	2	130.0	W	2	R	1
40	.10	.15	.023	3.00	3.54	1.40	.33	346.	3.84	1	3.45	2	130.0	W	2	E	1
41	.20	.20	.027	2.50	2.89	.95	.28	200.	4.43	4	5.74	0	0.0	S	2	E	1
42	.20	.20	.027	2.50	2.89	.95	.28	200.	4.43	4	5.74	0	0.0	S	2	E	1
43	.20	.20	.027	2.50	2.89	.95	.28	200.	4.43	4	5.74	0	20.0	S	2	E	1
44	.20	.20	.027	2.50	2.89	.95	.28	200.	4.43	4	5.74	0	20.0	S	2	E	1
45	.20	.20	.027	2.50	2.89	.95	.28	200.	4.43	4	5.74	0	40.0	S	2	E	1

TABLE A3-2

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
46	.20	.20	.027	2.50	2.89	.95	.28	200.	4.43	4	5.74	0	40.0	S	2	E	1
47	.20	.20	.027	2.50	2.89	.95	.28	200.	4.43	4	5.74	0	60.0	S	2	E	1
48	.20	.20	.027	2.50	2.89	.95	.28	200.	4.43	4	5.74	0	60.0	S	2	E	1
49	.20	.20	.027	2.50	2.89	.95	.56	200.	4.43	4	5.47	0	0.0	S	2	E	1
50	.20	.20	.027	2.50	2.89	.95	.56	200.	4.43	4	5.47	0	0.0	S	2	E	1
51	.20	.20	.027	2.50	2.89	.95	.56	200.	4.43	4	5.47	0	20.0	S	2	E	1
52	.20	.20	.027	2.50	2.89	.95	.56	200.	4.43	4	5.47	0	20.0	S	2	E	1
53	.20	.20	.027	2.50	2.89	.95	.56	200.	4.43	4	5.47	0	40.0	S	2	E	1
54	.20	.20	.027	2.50	2.89	.95	.56	200.	4.43	4	5.47	0	40.0	S	2	E	1
55	.20	.20	.027	2.50	2.89	.95	.56	200.	4.43	4	5.47	0	60.0	S	2	E	1
56	.20	.20	.027	2.50	2.89	.95	.56	200.	4.43	4	5.47	0	60.0	S	2	E	1
57	.20	.20	.027	2.50	2.89	.95	.56	200.	4.43	4	5.47	0	80.0	S	2	E	1
58	.20	.20	.027	2.50	2.89	.95	.56	200.	4.43	4	5.47	0	80.0	S	2	E	1
59	.20	.20	.027	2.50	2.89	.89	.28	200.	3.55	1	4.86	0	0.0	S	2	E	1
60	.20	.20	.027	2.50	2.89	.89	.28	200.	3.55	1	4.86	0	0.0	S	2	E	1
61	.20	.20	.027	2.50	2.89	.89	.28	200.	3.55	1	4.86	0	20.0	S	2	E	1
62	.20	.20	.027	2.50	2.89	.89	.28	200.	3.55	1	4.86	0	20.0	S	2	E	1
63	.20	.20	.027	2.50	2.89	.89	.28	200.	3.55	1	4.86	0	40.0	S	2	E	1
64	.20	.20	.027	2.50	2.89	.89	.28	200.	3.55	1	4.86	0	40.0	S	2	E	1
65	.20	.20	.027	2.50	2.89	.89	.56	200.	3.55	1	4.86	0	60.0	S	2	E	1
66	.20	.20	.027	2.50	2.89	.89	.56	200.	3.55	1	4.86	0	80.0	S	2	E	1
67	.20	.20	.027	2.50	2.89	.99	.28	210.	4.04	4	3.00	2	0.0	S	2	E	1
68	.20	.20	.027	2.50	2.89	.99	.28	210.	4.04	4	3.00	2	0.0	S	1	M	1
69	.20	.20	.027	2.50	2.89	.99	.28	210.	4.04	4	3.00	2	40.0	S	2	E	1
70	.20	.20	.027	2.50	2.89	.99	.28	210.	4.04	4	3.00	2	40.0	S	2	E	1
71	.20	.20	.027	2.50	2.89	.99	.28	210.	4.04	4	3.00	2	100.0	S	1	E	1
72	.20	.20	.027	2.50	2.89	.99	.28	210.	4.04	4	3.00	2	40.0	S	2	M	1
73	.20	.20	.027	2.50	2.89	.99	.28	210.	4.04	4	3.00	2	100.0	S	1	E	1
74	.20	.20	.027	2.50	2.89	.99	.28	210.	4.04	4	3.00	2	100.0	S	1	R	1
75	.20	.20	.027	2.50	2.89	.89	.28	230.	3.55	1	4.86	0	-10.0	S	1	M	1
76	.20	.20	.027	2.50	2.89	.89	.28	230.	3.55	1	4.86	0	-10.0	S	2	E	1
77	.20	.20	.027	2.50	2.89	.89	.28	230.	3.55	1	4.86	0	-20.0	S	1	M	1
78	.20	.20	.027	2.50	2.89	.89	.28	230.	3.55	1	4.86	0	-20.0	S	2	E	1
79	.20	.20	.030	2.50	2.94	.63	.33	219.	3.44	3	3.39	2	40.0	S	2	E	1
80	.20	.20	.030	2.50	2.94	.99	.33	219.	3.09	3	3.39	2	40.0	S	2	E	1
81	.20	.20	.030	2.50	2.94	1.42	.33	219.	3.22	3	3.39	2	40.0	S	2	E	1
82	.20	.20	.030	2.50	2.94	1.94	.33	219.	3.42	3	3.39	2	40.0	S	2	E	1
83	.20	.20	.030	2.50	2.94	.99	.28	213.	3.84	1	3.27	2	40.0	S	1	M	4
84	.20	.20	.030	2.50	2.94	1.94	.28	213.	3.65	1	3.27	2	40.0	S	1	M	4
85	.20	.20	.030	2.50	2.94	1.94	.56	213.	3.65	1	3.27	2	40.0	S	1	M	4
86	.20	.20	.030	2.50	2.94	.99	.28	213.	3.84	1	3.27	2	100.0	S	1	M	4
87	.20	.20	.030	2.50	2.94	1.94	.28	213.	3.65	1	3.27	2	100.0	S	1	M	4
88	.20	.20	.030	2.50	2.94	1.94	.56	213.	3.65	1	3.27	2	100.0	S	1	M	4
89	.20	.20	.030	2.50	2.94	1.94	.56	213.	4.95	4	3.27	2	100.0	S	1	M	4
90	.20	.20	.030	2.50	2.94	.99	.28	228.	3.84	1	3.27	2	40.0	S	1	M	2

TABLE A3-3

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
91	.20	.20	.030	2.50	2.94	1.94	.28	228.	3.65	1	3.27	2	40.0	S	1	M	2
92	.20	.20	.030	2.50	2.94	1.94	.56	228.	3.65	1	3.27	2	40.0	S	1	M	2
93	.20	.20	.030	2.50	2.94	.99	.28	228.	3.84	1	3.27	2	100.0	S	1	M	2
94	.20	.20	.030	2.50	2.94	1.94	.28	228.	3.65	1	3.27	2	100.0	S	1	M	2
95	.20	.20	.030	2.50	2.94	1.94	.56	228.	3.65	1	3.27	2	100.0	S	1	M	2
96	.20	.20	.030	2.50	2.94	1.94	.56	228.	4.95	4	3.27	2	100.0	S	1	M	2
97	.20	.20	.030	2.50	2.94	.99	.28	267.	3.84	1	3.27	2	40.0	S	1	M	2
98	.20	.20	.030	2.50	2.94	1.94	.28	267.	3.65	1	3.27	2	40.0	S	1	M	2
99	.20	.20	.030	2.50	2.94	1.94	.56	267.	3.65	1	3.27	2	40.0	S	1	M	2
100	.20	.20	.030	2.50	2.94	.99	.28	267.	3.84	1	3.27	2	100.0	S	1	M	2
101	.20	.20	.030	2.50	2.94	1.94	.28	267.	3.65	1	3.27	2	100.0	S	1	M	2
102	.20	.20	.030	2.50	2.94	1.94	.56	267.	3.65	1	3.27	2	100.0	S	1	M	2
103	.20	.20	.030	2.50	2.94	1.94	.56	267.	4.95	4	3.27	2	40.0	S	1	M	2
104	.20	.20	.030	2.50	2.94	.99	.28	297.	3.85	1	3.27	2	40.0	S	1	M	3
105	.20	.20	.030	2.50	2.94	1.94	.28	297.	3.65	1	3.27	2	40.0	S	1	M	3
106	.20	.20	.030	2.50	2.94	1.94	.56	297.	3.65	1	3.27	2	40.0	S	1	M	3
107	.20	.20	.030	2.50	2.94	.99	.28	297.	3.84	1	3.27	2	100.0	S	1	M	3
108	.20	.20	.030	2.50	2.94	1.94	.28	297.	3.65	1	3.27	2	100.0	S	1	M	3
109	.20	.20	.030	2.50	2.94	1.94	.56	297.	3.65	1	3.27	2	100.0	S	1	M	3
110	.20	.20	.030	2.50	2.94	1.94	.56	297.	4.95	4	3.27	2	40.0	S	1	M	3
111	.30	.30	.052	2.33	2.82	1.99	.50	211.	3.44	3	3.49	3	0.0	S	2	E	1
112	.30	.30	.052	2.33	2.82	1.99	.85	211.	3.44	3	3.49	3	0.0	S	2	E	1
113	.30	.30	.052	2.33	2.82	1.99	.30	223.	3.44	3	3.49	3	56.0	S	2	R	1
114	.30	.30	.052	2.33	2.82	1.99	.50	201.	3.44	3	3.49	3	56.0	S	2	E	1
115	.30	.30	.052	2.33	2.82	1.99	.85	210.	3.44	3	3.49	3	56.0	S	2	E	1
116	.30	.30	.052	2.33	2.82	1.99	1.19	203.	3.44	3	3.49	3	56.0	S	2	E	1
117	.30	.30	.052	2.33	2.82	1.99	.50	210.	3.44	3	3.49	3	80.0	S	2	E	1
118	.30	.30	.052	2.33	2.82	1.99	.85	210.	3.44	3	3.49	3	80.0	S	2	E	1
119	.30	.30	.052	2.33	2.82	1.99	1.19	211.	3.44	3	3.49	3	80.0	S	2	E	1
120	.30	.30	.052	2.33	2.82	1.99	.85	217.	3.44	3	3.49	3	56.0	S	2	E	1
121	.30	.30	.052	2.33	2.82	1.99	.85	205.	3.44	3	3.49	3	80.0	S	2	E	1
122	.30	.30	.052	2.33	2.82	1.99	1.21	210.	3.44	3	3.63	1	56.0	S	2	E	1
123	.30	.30	.052	2.33	2.82	1.99	1.21	205.	3.44	3	3.63	1	80.0	S	2	E	1
124	.30	.30	.052	2.33	2.82	1.99	.85	210.	3.44	3	3.53	1	56.0	S	2	E	1
125	.30	.30	.052	2.33	2.82	1.99	1.20	205.	3.44	3	3.53	1	56.0	S	2	E	1
126	.30	.30	.052	1.50	1.81	1.99	0.00	221.	3.52	1	0.00	0	0.0	S	2	E	1
127	.30	.30	.052	1.50	1.81	1.99	0.00	221.	3.52	1	0.00	0	56.0	S	1	M	1
128	.30	.30	.052	1.50	1.81	1.99	0.00	221.	3.52	1	0.00	0	80.0	S	1	M	1
129	.30	.30	.052	1.50	1.81	1.99	.30	226.	3.52	1	3.78	1	0.0	S	2	E	1
130	.30	.30	.052	1.50	1.81	1.99	.30	226.	3.52	1	3.78	1	56.0	S	2	R	1
131	.30	.30	.052	1.50	1.81	1.99	.30	226.	3.52	1	3.78	1	80.0	S	2	R	1
132	.30	.30	.052	1.50	1.81	1.99	.50	187.	3.52	1	3.78	1	0.0	S	2	E	1
133	.30	.30	.052	1.50	1.81	1.99	.50	187.	3.52	1	3.78	1	56.0	S	2	R	1
134	.30	.30	.052	1.50	1.81	1.99	.50	187.	3.52	1	3.78	1	80.0	S	2	E	1
135	.30	.30	.052	1.50	1.81	1.99	.85	211.	3.52	1	3.78	1	0.0	S	2	R	1

TABLE A3-4

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
136	.30	.30	.052	1.50	1.81	1.99	.85	211.	3.52	1	3.78	1	56.0	S	2	R	1
137	.30	.30	.052	1.50	1.81	1.99	.85	211.	3.52	1	3.78	1	80.0	S	2	R	1
138	.30	.30	.052	1.50	1.81	1.99	1.19	200.	3.52	1	3.78	1	0.0	S	2	E	1
139	.30	.30	.052	1.50	1.81	1.99	1.19	200.	3.52	1	3.78	1	56.0	S	2	E	1
140	.30	.30	.052	1.50	1.81	1.99	1.19	200.	3.52	1	3.78	1	80.0	S	2	E	1
141	.12	.12	.029	3.00	3.96	4.21	0.00	189.	3.31	2	0.00	0	120.0	T	1	M	1
142	.12	.12	.029	3.00	3.96	4.21	0.00	189.	3.31	2	0.00	0	52.8	T	1	M	1
143	.12	.12	.029	3.00	3.96	4.21	0.00	189.	3.31	2	0.00	0	22.9	T	1	M	1
144	.12	.12	.029	3.00	3.96	4.21	0.00	189.	3.31	2	0.00	0	12.5	T	1	M	1
145	.12	.12	.029	3.00	3.96	4.21	0.00	189.	3.31	2	0.00	0	0.0	T	1	M	1
146	.12	.12	.029	3.00	3.96	4.21	0.00	189.	3.31	2	0.00	0	141.0	T	1	M	1
147	.12	.12	.029	3.00	3.96	4.21	0.00	241.	3.31	2	0.00	0	62.5	T	1	M	1
148	.12	.12	.029	3.00	3.96	4.21	0.00	241.	3.31	2	0.00	0	26.4	T	1	M	1
149	.12	.12	.029	3.00	3.96	4.21	0.00	241.	3.31	2	0.00	0	16.0	T	1	M	1
150	.12	.12	.029	3.00	3.96	4.21	0.00	241.	3.31	2	0.00	0	0.0	T	1	M	1
151	.12	.12	.029	2.00	2.64	4.21	0.00	164.	3.31	2	0.00	0	41.7	T	1	M	1
152	.12	.12	.029	3.00	3.96	4.21	0.00	164.	3.31	2	0.00	0	43.8	T	1	M	1
153	.12	.12	.029	3.00	3.96	4.21	0.00	164.	3.31	2	0.00	0	66.0	T	1	M	1
154	.12	.12	.029	2.00	2.64	4.21	0.00	220.	3.31	2	0.00	0	46.5	T	1	M	1
155	.12	.12	.029	3.00	3.96	4.21	0.00	220.	3.31	2	0.00	0	62.2	T	1	M	1
156	.12	.12	.029	4.00	5.27	4.21	0.00	220.	3.31	2	0.00	0	62.6	T	1	M	1
157	.12	.12	.029	2.00	2.64	4.21	.52	191.	3.31	2	3.66	2	69.0	T	1	M	1
158	.12	.12	.029	3.00	3.96	4.21	.52	191.	3.31	2	3.66	2	87.5	T	1	M	1
159	.12	.12	.029	4.00	5.27	4.21	.52	191.	3.31	2	3.66	2	90.6	T	1	M	1
160	.12	.12	.029	3.00	3.96	4.21	.52	181.	3.31	2	3.66	2	50.9	T	1	M	1
161	.12	.12	.029	3.00	3.96	4.21	.52	181.	3.31	2	3.66	2	51.0	T	1	M	1
162	.12	.12	.029	3.00	3.96	4.21	.52	181.	3.31	2	3.66	2	29.0	T	1	M	1
163	.12	.12	.029	3.00	3.96	4.21	.52	181.	3.31	2	3.66	2	19.7	T	1	M	1
164	.12	.12	.029	3.00	3.96	4.21	.52	181.	3.31	2	3.66	2	0.0	T	1	M	1
165	.12	.12	.029	3.00	3.96	4.21	0.00	124.	3.31	2	0.00	0	44.3	T	1	M	1
166	.12	.12	.029	3.00	3.96	4.21	.52	124.	3.31	2	3.66	2	58.6	T	1	M	1
167	.12	.12	.029	3.00	3.96	4.21	.62	124.	3.31	2	3.66	2	61.1	T	1	M	1
168	.12	.12	.029	3.00	3.96	4.21	.87	124.	3.31	2	3.66	2	56.9	T	1	M	1
169	.12	.12	.029	3.00	3.96	4.21	1.04	124.	3.31	2	3.66	2	65.2	T	1	M	1
170	.12	.12	.029	3.00	3.96	4.21	1.56	124.	3.31	2	3.66	2	70.1	T	1	M	1
171	.12	.12	.029	3.00	3.96	4.21	.25	124.	3.31	2	3.66	2	80.4	T	1	M	1
172	.12	.12	.029	3.00	3.96	4.21	0.00	238.	3.30	2	0.00	0	51.4	T	1	M	1
173	.12	.12	.029	3.00	3.96	4.21	.78	238.	3.30	2	2.60	2	75.7	T	1	M	1
174	.12	.12	.029	3.00	3.96	4.21	.78	238.	3.30	2	2.60	2	72.2	T	1	M	1
175	.12	.12	.029	3.00	3.96	4.21	.78	238.	3.30	2	2.60	2	60.4	T	1	M	1
176	.12	.12	.029	3.00	3.96	4.21	.78	238.	3.30	2	2.60	2	66.7	T	1	M	1
177	.12	.12	.029	3.00	3.96	4.21	.78	238.	3.30	2	2.60	2	79.2	T	1	M	1
178	.40	.60	.050	1.00	1.09	1.48	.40	232.	3.46	3	3.06	2	40.0	O	2	M	1
179	.40	.60	.050	1.00	1.09	1.48	.40	243.	3.46	3	3.06	2	40.0	O	2	M	1
180	.40	.60	.050	1.00	1.09	1.48	.40	253.	3.46	3	3.06	2	40.0	O	2	M	1

TABLE A3-5

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
181	.40	.60	.050	1.00	1.09	1.44	.20	232.	3.46	3	3.06	2	40.0	O	2	M	1
182	.40	.60	.050	1.00	1.09	1.44	.20	206.	3.46	3	3.06	2	40.0	O	2	M	1
183	.40	.60	.050	1.00	1.09	1.44	.20	209.	3.46	3	3.06	2	40.0	O	2	M	1
184	.40	.60	.050	1.00	1.09	1.44	.28	232.	3.46	3	3.06	2	40.0	O	2	M	1
185	.40	.60	.050	1.00	1.09	1.48	.28	243.	3.46	3	3.06	2	40.0	O	2	E	1
186	.40	.60	.050	1.00	1.09	1.48	.28	219.	3.46	3	3.06	2	40.0	O	2	R	1
187	.40	.60	.050	1.00	1.09	1.48	.40	186.	3.46	3	3.06	2	40.0	O	2	R	1
188	.40	.60	.050	1.00	1.09	1.48	.40	174.	3.46	3	3.06	2	40.0	O	2	E	1
189	.40	.60	.050	1.00	1.09	1.48	.40	144.	3.46	3	3.06	2	40.0	O	2	E	1
190	.40	.60	.050	1.00	1.09	1.48	.20	186.	3.46	3	3.06	2	40.0	O	2	R	1
191	.40	.60	.050	1.00	1.09	1.48	.20	174.	3.46	3	3.06	2	40.0	O	2	R	1
192	.40	.60	.050	1.00	1.09	1.48	.20	144.	3.46	3	3.06	2	40.0	O	2	R	1
193	.40	.60	.050	1.00	1.09	1.48	.21	186.	3.46	3	3.06	2	40.0	O	2	E	1
194	.40	.60	.050	1.00	1.09	1.48	.21	174.	3.46	3	3.06	2	40.0	O	2	R	1
195	.40	.60	.050	1.00	1.09	1.48	.21	144.	3.46	3	3.06	2	40.0	O	2	R	1
196	.35	.35	.040	2.14	2.42	.93	.91	375.	3.70	1	3.60	2	120.0	O	2	E	2
197	.35	.35	.040	2.14	2.42	.93	.60	363.	3.70	1	3.60	2	120.0	O	2	E	2
198	.35	.35	.040	2.14	2.42	.93	1.21	366.	3.70	1	3.60	2	120.0	O	2	E	2
199	.35	.35	.040	2.14	2.42	.93	.60	358.	3.70	1	3.06	2	120.0	O	2	E	2
200	.35	.35	.040	2.14	2.42	.93	.91	370.	3.70	1	3.60	2	120.0	O	2	E	2
201	.35	.35	.040	2.14	2.42	.93	1.21	365.	3.70	1	3.60	2	120.0	O	2	E	2
202	.35	.35	.040	2.14	2.42	.93	.60	371.	3.70	1	3.60	2	120.0	O	2	E	2
203	.35	.35	.040	2.14	2.42	.93	.91	377.	3.70	1	3.60	2	120.0	O	2	E	2
204	.35	.35	.040	2.14	2.42	.93	1.21	368.	3.70	1	3.60	2	120.0	O	2	E	2
205	.20	.20	.020	3.00	3.33	.95	.28	180.	4.73	4	3.33	2	40.0	S	2	E	1
206	.20	.20	.020	3.00	3.33	.95	.28	180.	4.73	4	3.33	2	100.0	S	2	E	1
207	.20	.20	.020	2.00	2.22	.95	.28	180.	4.73	4	3.33	2	40.0	S	2	E	1
208	.20	.20	.020	2.00	2.22	.95	.28	180.	4.73	4	3.33	2	100.0	S	2	E	1
209	.20	.20	.020	3.00	3.33	.95	.56	180.	4.73	4	3.33	2	40.0	S	2	E	1
210	.20	.20	.020	3.00	3.33	.95	.56	180.	4.73	4	3.33	2	100.0	S	2	E	1
211	.20	.20	.020	2.00	2.22	.95	.56	180.	4.73	4	3.33	2	40.0	S	2	E	1
212	.20	.20	.020	2.00	2.22	.95	.56	180.	4.73	4	3.33	2	100.0	S	2	E	1
213	.20	.20	.020	3.00	3.33	.95	.14	180.	4.73	4	3.33	2	40.0	S	2	R	1
214	.20	.20	.020	3.00	3.33	.95	.14	180.	4.73	4	3.33	2	100.0	S	2	R	1
215	.20	.20	.020	2.00	2.22	.95	.14	180.	4.73	4	3.33	2	40.0	S	2	M	1
216	.20	.20	.020	2.00	2.22	.95	.14	180.	4.73	4	3.33	2	100.0	S	2	M	1
217	.20	.20	.020	2.00	2.22	.53	.31	336.	3.89	1	6.64	0	100.0	O	2	E	1
218	.20	.20	.020	2.00	2.22	.53	.16	336.	3.89	1	6.64	0	100.0	O	2	E	1
219	.20	.20	.020	2.00	2.22	.53	.21	336.	3.89	1	6.64	0	40.0	O	2	E	1
220	.20	.20	.020	2.00	2.22	.53	.10	336.	3.89	1	6.64	0	40.0	O	2	E	1
221	.20	.20	.020	2.00	2.22	.53	.42	336.	3.89	1	6.64	0	160.0	O	2	E	1
222	.20	.20	.020	2.00	2.22	.53	.21	336.	3.89	1	6.64	0	160.0	O	2	E	1
223	.20	.20	.020	2.00	2.22	.95	.31	336.	3.95	1	6.64	0	100.0	O	2	E	1
224	.20	.20	.020	2.00	2.22	.95	.16	336.	3.95	1	6.64	0	100.0	O	2	E	1
225	.20	.20	.020	2.00	2.22	.53	.31	336.	3.89	1	6.64	0	100.0	O	2	E	1

TABLE A3-6

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
226	.20	.20	.020	2.00	2.22	.53	.16	336.	3.89	1	6.64	0	100.0	O	2	E	1
227	.20	.20	.020	2.00	2.22	.53	.42	336.	3.89	1	6.64	0	160.0	O	2	E	1
228	.20	.20	.020	2.00	2.22	.53	.21	336.	3.89	1	6.64	0	160.0	O	2	E	1
229	.20	.20	.020	2.00	2.22	.48	.12	151.	3.28	2	5.36	0	14.0	O	2	E	1
230	.20	.20	.020	2.00	2.22	.48	.12	142.	3.28	2	5.36	0	14.0	O	2	E	1
231	.20	.20	.020	2.00	2.22	.48	.12	151.	3.28	2	5.36	0	40.0	O	2	E	1
232	.20	.20	.020	2.00	2.22	.48	.12	134.	3.28	2	5.36	0	40.0	O	2	E	1
233	.20	.20	.020	2.00	2.22	.50	.12	142.	3.79	1	5.36	0	40.0	O	2	E	1
234	.20	.20	.020	2.00	2.22	.50	.12	134.	3.79	1	5.36	0	40.0	O	2	E	1
235	.25	.50	.050	2.00	2.22	.45	.11	134.	3.79	2	5.36	0	19.6	O	2	E	1
236	.25	.50	.050	2.00	2.22	.45	.11	146.	3.49	2	5.36	0	7.4	O	2	R	1
237	.25	.50	.050	1.00	1.11	.68	.11	146.	3.49	2	5.36	0	19.6	O	2	R	1
238	.25	.50	.050	1.00	1.11	.68	.11	146.	3.49	2	5.36	0	10.8	O	2	R	1
239	.15	.15	.020	2.33	2.69	.56	.37	215.	3.23	2	3.50	0	40.0	S	1	M	1
240	.15	.15	.020	2.33	2.69	.56	.37	215.	3.23	2	3.50	0	40.0	S	1	M	1
241	.15	.15	.020	2.33	2.69	.56	.37	215.	3.23	2	3.50	2	40.0	S	1	M	1
242	.15	.15	.020	2.33	2.69	.56	.37	215.	3.23	2	3.50	2	100.0	S	1	M	1
243	.15	.15	.020	2.33	2.69	.56	.37	215.	3.23	2	3.50	2	100.0	S	1	M	1
244	.15	.15	.020	2.33	2.69	.56	.37	215.	3.23	2	3.50	2	100.0	S	1	M	1
245	.15	.15	.020	2.33	2.69	.56	.75	215.	3.23	2	3.50	2	40.0	S	1	M	1
246	.15	.15	.020	2.33	2.69	.56	.75	215.	3.23	2	3.50	2	40.0	S	1	M	1
247	.15	.15	.020	2.33	2.69	.56	.75	215.	3.23	2	3.50	2	100.0	S	1	M	1
248	.15	.15	.020	2.33	2.69	.56	.75	215.	3.23	2	3.50	2	100.0	S	1	M	1
249	.15	.15	.020	2.33	2.69	.56	.75	215.	3.23	2	3.50	2	100.0	S	1	M	1
250	.15	.15	.020	2.33	2.69	.56	.75	215.	3.23	2	3.50	2	100.0	S	1	M	1
251	.15	.15	.020	2.33	2.69	.64	.37	248.	3.15	0	3.50	2	40.0	S	1	M	1
252	.15	.15	.020	2.33	2.69	.64	.37	248.	3.15	0	3.50	2	40.0	S	1	M	1
253	.15	.15	.020	2.33	2.69	.64	.37	248.	3.15	0	3.50	2	40.0	S	1	M	1
254	.15	.15	.020	2.33	2.69	.64	.37	248.	3.15	0	3.50	2	100.0	S	1	M	1
255	.15	.15	.020	2.33	2.69	.64	.37	248.	3.15	0	3.50	2	100.0	S	1	M	1
256	.15	.15	.020	2.33	2.69	.64	.37	248.	3.15	0	3.50	2	100.0	S	1	M	1
257	.15	.15	.020	2.33	2.69	.64	.75	248.	3.15	0	3.50	2	40.0	S	1	M	1
258	.15	.15	.020	2.33	2.69	.64	.75	248.	3.15	0	3.50	2	40.0	S	1	M	1
259	.15	.15	.020	2.33	2.69	.64	.75	248.	3.15	0	3.50	2	40.0	S	1	M	1
260	.15	.15	.020	2.33	2.69	.64	.75	248.	3.15	0	3.50	2	100.0	S	1	M	1
261	.15	.15	.020	2.33	2.69	.64	.75	248.	3.15	0	3.50	2	100.0	S	1	M	1
262	.15	.15	.020	2.33	2.69	.64	.75	248.	3.15	0	3.50	2	100.0	S	1	M	1
263	.15	.15	.020	2.33	2.69	.56	.37	206.	3.23	2	3.50	2	40.0	S	2	E	1
264	.15	.15	.020	2.33	2.69	.56	.37	206.	3.23	2	3.50	2	40.0	S	2	E	1
265	.15	.15	.020	2.33	2.69	.56	.37	206.	3.23	2	3.50	2	100.0	S	2	R	1
266	.15	.15	.020	2.33	2.69	.56	.37	206.	3.23	2	3.50	2	100.0	S	2	R	1
267	.15	.15	.020	2.33	2.69	.56	.75	206.	3.23	2	3.50	2	40.0	S	2	E	1
268	.15	.15	.020	2.33	2.69	.56	.75	206.	3.23	2	3.50	2	40.0	S	2	E	1
269	.15	.15	.020	2.33	2.69	.56	.75	206.	3.23	2	3.50	2	100.0	S	2	E	1
270	.15	.15	.020	2.33	2.69	.56	.75	206.	3.23	2	3.50	2	100.0	S	2	E	1

TABLE A3-7

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
271	.15	.15	.020	2.33	2.69	.60	.37	200.	3.15	0	3.50	2	40.0	S	2	R	1
272	.15	.15	.020	2.33	2.69	.60	.37	200.	3.15	0	3.50	2	40.0	S	2	E	1
273	.15	.15	.020	2.33	2.69	.60	.37	200.	3.15	0	3.50	2	100.0	S	2	R	1
274	.15	.15	.020	2.33	2.69	.60	.37	200.	3.15	0	3.50	2	100.0	S	2	R	1
275	.15	.15	.020	2.33	2.69	.60	.75	200.	3.15	0	3.50	2	40.0	S	2	E	1
276	.15	.15	.020	2.33	2.69	.60	.75	200.	3.15	0	3.50	2	40.0	S	2	E	1
277	.15	.15	.020	2.33	2.69	.60	.75	200.	3.15	0	3.50	2	100.0	S	2	R	1
278	.15	.15	.020	2.33	2.69	.60	.75	200.	3.15	0	3.50	2	100.0	S	2	R	1
279	.16	.16	.020	1.00	1.14	1.04	.87	202.	2.80	2	2.14	2	90.0	O	2	R	1
280	.16	.16	.020	1.00	1.14	1.04	.44	202.	2.80	2	2.14	2	90.0	O	2	R	1
281	.16	.16	.020	1.00	1.14	1.04	.22	202.	2.80	2	2.14	2	90.0	O	2	R	1
282	.16	.16	.020	1.00	1.14	1.04	0.00	202.	2.80	2	0.00	0	90.0	O	2	R	1
283	.16	.16	.020	1.00	1.14	1.04	0.00	291.	2.80	2	0.00	0	140.0	S	1	M	1
284	.16	.16	.020	2.00	2.29	1.04	0.00	360.	2.80	2	0.00	0	140.0	S	1	M	1
285	.16	.16	.020	3.00	3.43	1.04	0.00	360.	2.80	2	0.00	0	140.0	S	1	M	1
286	.16	.16	.020	3.00	3.43	1.04	0.00	360.	2.80	2	0.00	0	70.0	S	1	M	1
287	.16	.16	.020	3.00	3.43	1.04	0.00	360.	2.80	2	0.00	0	0.0	S	1	M	1
288	.16	.16	.020	4.00	4.57	1.04	0.00	360.	2.80	2	0.00	0	140.0	S	1	M	1
289	.16	.16	.020	.50	.57	1.04	0.00	291.	2.80	2	0.00	0	117.2	O	2	R	1
290	.16	.16	.020	1.00	1.14	1.04	0.00	291.	2.80	2	0.00	0	117.2	O	2	R	1
291	.16	.16	.020	1.50	1.71	1.04	0.00	291.	2.80	2	0.00	0	117.2	O	2	R	1
292	.16	.16	.020	1.50	1.71	1.04	0.00	291.	2.80	2	0.00	0	0.0	O	2	R	1
293	.16	.16	.020	.52	.59	1.04	0.00	291.	2.80	2	0.00	0	117.2	O	2	R	1
294	.16	.16	.020	1.05	1.20	1.04	0.00	291.	2.80	2	0.00	0	117.2	O	2	R	1
295	.16	.16	.020	1.57	1.79	1.04	0.00	291.	2.80	2	0.00	0	117.2	O	2	R	1
296	.16	.16	.020	1.57	1.79	1.04	0.00	291.	2.80	2	0.00	0	0.0	O	2	R	1
297	.16	.16	.020	.52	.59	1.04	0.00	213.	3.04	2	0.00	0	46.9	O	2	R	1
298	.16	.16	.020	1.05	1.20	1.04	0.00	213.	3.04	2	0.00	0	46.9	O	2	R	1
299	.16	.16	.020	1.57	1.79	1.04	0.00	213.	3.04	2	0.00	0	46.9	O	2	R	1
300	.16	.16	.020	2.10	2.40	1.04	0.00	213.	3.04	2	0.00	0	46.9	O	2	R	1
301	.16	.16	.020	.52	.59	1.04	0.00	197.	3.04	2	0.00	0	0.0	O	2	R	1
302	.16	.16	.020	1.05	1.20	1.04	0.00	197.	3.04	2	0.00	0	0.0	O	2	R	1
303	.16	.16	.020	1.57	1.79	1.04	0.00	197.	3.04	2	0.00	0	0.0	O	2	R	1
304	.16	.16	.020	2.10	2.40	1.04	0.00	197.	3.04	2	0.00	0	0.0	O	2	R	1
305	.20	.30	.056	4.00	4.92	1.69	.63	311.	3.77	1	3.25	2	139.3	S	2	R	1
306	.20	.30	.056	4.00	4.92	1.69	.63	311.	3.77	1	3.25	2	55.7	S	2	R	1
307	.20	.30	.056	4.00	4.92	.84	.63	311.	3.77	1	3.25	2	139.3	S	2	R	1
308	.20	.30	.056	4.00	4.92	.84	.63	311.	3.77	1	3.25	2	55.7	S	2	R	1
309	.20	.30	.056	4.00	4.92	1.69	.63	311.	3.77	1	3.25	2	55.7	S	2	R	1
310	.20	.30	.056	4.00	4.92	.84	.63	311.	3.77	1	3.25	2	139.3	S	2	R	1
311	.20	.30	.056	4.00	4.92	1.69	.63	210.	3.77	1	3.25	2	102.8	S	2	R	1
312	.20	.30	.056	4.00	4.92	1.69	.63	233.	3.77	1	3.25	2	50.0	S	2	R	1
313	.20	.30	.056	4.00	4.92	.84	.63	233.	3.77	1	3.25	2	125.2	S	2	R	1
314	.20	.30	.056	4.00	4.92	.84	.63	233.	3.77	1	3.25	2	50.2	S	2	R	1
315	.20	.30	.056	4.00	4.92	1.69	.63	428.	3.77	1	3.25	2	241.2	S	2	R	1

TABLE A3-8

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
316	.20	.30	.056	4.00	4.92	.84	.63	428.	3.77	1	3.25	2	241.2	S	2	R	1
317	.20	.30	.056	4.00	4.92	1.69	.63	428.	3.77	1	3.25	2	168.8	S	2	R	1
318	.20	.30	.056	4.00	4.92	.84	.63	428.	3.77	1	3.25	2	168.8	S	2	R	1
319	.20	.30	.056	4.00	4.92	1.69	.63	428.	3.77	1	3.25	2	96.5	S	2	R	1
320	.20	.30	.056	4.00	4.92	.84	.63	428.	3.77	1	3.25	2	96.5	S	2	R	1
335	.25	.50	.050	1.00	1.11	.68	.25	127.	3.30	2	3.15	2	10.0	O	2	R	1
336	.25	.50	.050	1.00	1.11	.68	.51	127.	3.30	2	3.15	2	10.0	O	2	R	1
337	.25	.50	.050	1.00	1.11	.68	.85	130.	3.30	2	3.15	2	10.0	O	2	R	1
338	.25	.50	.050	1.00	1.11	.68	1.32	146.	3.30	2	3.06	2	10.0	O	2	R	1
339	.25	.50	.050	1.00	1.11	.68	.60	130.	3.30	2	3.15	2	20.0	O	2	R	1
340	.25	.50	.050	1.00	1.11	.68	1.06	146.	3.30	2	3.06	2	20.0	O	2	R	1
341	.25	.50	.050	1.00	1.11	.68	.11	146.	3.30	2	5.36	2	20.0	O	2	R	1
342	.25	.50	.050	1.00	1.11	.68	.11	146.	3.30	2	5.36	2	10.0	O	2	R	1
343	.20	.20	.030	1.50	1.76	.53	.47	210.	3.92	1	3.19	2	0.0	O	1	M	1
344	.20	.20	.030	1.50	1.76	.53	.28	210.	3.92	1	3.19	2	0.0	O	2	E	1
345	.20	.20	.030	1.50	1.76	.53	.28	210.	3.92	1	3.19	2	0.0	O	2	E	1
346	.20	.20	.030	1.50	1.76	.53	.47	210.	3.92	1	3.19	2	0.0	O	2	E	1
347	.20	.20	.030	1.50	1.76	.53	.70	210.	3.92	1	3.19	2	0.0	O	2	E	1
348	.20	.20	.030	1.50	1.76	.53	.70	210.	3.92	1	3.19	2	0.0	O	2	E	1
349	.20	.20	.030	1.50	1.76	.53	.93	210.	3.92	1	3.19	2	0.0	O	2	E	1
350	.20	.20	.030	1.50	1.76	.53	.70	210.	3.92	1	3.19	2	0.0	O	2	E	1
351	.20	.20	.030	1.50	1.76	.53	.47	210.	3.92	1	3.19	2	40.0	O	1	M	1
352	.20	.20	.030	1.50	1.76	.53	.96	210.	3.92	1	3.19	2	40.0	O	1	M	1
353	.20	.20	.030	1.50	1.76	.53	.47	210.	3.92	1	3.19	2	40.0	O	2	E	1
354	.20	.20	.030	1.50	1.76	.53	.96	210.	3.92	1	3.19	2	40.0	O	2	E	1
355	.20	.20	.030	1.50	1.76	.71	.47	210.	3.92	1	3.19	2	0.0	O	1	M	1
356	.20	.20	.030	1.50	1.76	.71	.94	210.	3.92	1	3.19	2	0.0	O	1	M	1
357	.20	.20	.030	1.50	1.76	.71	.28	210.	3.92	1	3.19	2	0.0	O	2	E	1
358	.20	.20	.030	1.50	1.76	.71	.47	210.	3.92	1	3.19	2	0.0	O	2	E	1
359	.20	.20	.030	1.50	1.76	.71	.47	210.	3.92	1	3.19	2	0.0	O	2	E	1
360	.20	.20	.030	1.50	1.76	.71	.70	210.	3.92	1	3.19	2	0.0	O	2	E	1
361	.20	.20	.030	1.50	1.76	.71	.93	210.	3.92	1	3.19	2	0.0	O	2	E	1
362	.20	.20	.030	1.50	1.76	.71	.94	210.	3.92	1	3.19	2	0.0	O	2	E	1
363	.20	.20	.030	1.50	1.76	.71	.94	210.	3.92	1	3.19	2	0.0	O	2	E	1
364	.20	.20	.030	1.50	1.76	.71	1.41	210.	3.92	1	3.19	2	0.0	O	2	E	1
365	.20	.20	.030	1.50	1.76	.71	1.41	210.	3.92	1	3.19	2	0.0	O	2	E	1
366	.20	.20	.030	1.50	1.76	.71	.93	210.	3.92	1	3.19	2	40.0	O	1	M	1
367	.20	.20	.030	1.50	1.76	.71	.93	210.	3.92	1	3.19	2	40.0	O	2	E	1
368	.20	.20	.030	1.50	1.76	.71	.94	210.	3.92	1	3.19	2	40.0	O	2	E	1
369	.20	.20	.030	1.50	1.76	.53	.93	210.	3.92	1	3.19	2	40.0	O	2	E	1
372	.20	.20	.030	2.50	2.94	.63	.31	203.	5.32	4	3.60	2	40.0	S	2	E	1
373	.20	.20	.030	2.50	2.94	.99	.31	209.	5.35	4	3.60	2	40.0	S	2	E	1
374	.20	.20	.030	2.50	2.94	1.42	.31	243.	5.01	4	3.60	2	40.0	S	2	E	1
375	.20	.20	.030	2.50	2.94	1.94	.31	222.	4.24	4	3.60	2	40.0	S	2	E	1
376	.20	.20	.030	2.50	2.94	.99	.62	223.	5.35	4	3.60	2	40.0	S	2	E	1

TABLE A3-9

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
377	.20	.20	.030	2.50	2.94	.99	.15	222.	5.35	4	3.60	2	40.0	S	2	R	1
378	.20	.20	.020	2.50	2.78	1.42	.33	228.	3.03	3	3.39	2	40.0	S	2	R	1
379	.20	.20	.020	2.50	2.78	1.27	.33	228.	3.71	1	3.39	2	40.0	S	2	R	1
380	.20	.20	.020	2.50	2.78	1.42	.33	228.	3.24	3	3.39	2	40.0	S	2	R	1
381	.20	.20	.020	2.50	2.78	1.42	.50	228.	3.03	3	3.50	2	40.0	S	2	R	1
382	.20	.20	.020	2.50	2.78	1.42	.50	228.	3.03	3	3.50	2	40.0	S	2	R	1
383	.20	.20	.020	2.50	2.78	1.42	.33	340.	3.03	3	3.39	2	100.0	S	2	R	1
384	.20	.20	.020	2.50	2.78	1.27	.33	340.	3.71	1	3.39	2	100.0	S	2	R	1
385	.20	.20	.020	2.50	2.78	1.42	.33	340.	3.24	3	3.39	2	100.0	S	2	R	1
386	.20	.20	.020	2.50	2.78	1.42	.50	340.	3.03	3	3.50	2	100.0	S	2	R	1
387	.20	.20	.020	2.50	2.78	1.42	.50	340.	3.03	3	3.50	2	100.0	S	2	R	1
388	.15	.20	.040	1.25	1.56	4.27	0.00	163.	4.70	4	3.70	4	39.4	S	1	R	1
389	.15	.20	.040	1.25	1.56	4.27	.44	163.	4.70	4	3.33	2	39.4	S	1	R	1
390	.15	.20	.040	1.25	1.56	4.27	.88	163.	4.70	4	3.33	2	39.4	S	1	R	1
391	.15	.20	.040	1.25	1.56	4.27	1.27	163.	4.70	4	4.89	4	39.4	S	1	R	1
392	.15	.20	.040	2.50	3.13	1.32	.44	163.	4.77	4	3.33	2	39.4	S	1	R	1
393	.15	.20	.040	2.50	3.13	2.59	0.00	163.	4.75	4	3.70	4	39.4	S	1	R	1
394	.15	.20	.040	2.50	3.13	2.59	.44	163.	4.75	4	3.30	2	39.4	S	1	R	1
395	.15	.20	.040	2.50	3.13	2.59	.88	163.	4.75	4	3.33	2	39.4	S	1	R	1
396	.15	.20	.040	2.50	3.13	2.59	.44	317.	4.25	4	3.33	2	39.4	S	1	R	1
397	.15	.20	.040	2.50	3.13	2.59	.88	317.	4.25	4	3.33	2	39.4	S	1	R	1
398	.15	.20	.040	2.50	3.13	4.27	0.00	163.	4.70	4	3.70	4	39.4	S	1	R	1
399	.15	.20	.040	2.50	3.13	4.27	.44	163.	4.70	4	3.33	2	39.4	S	1	R	1
400	.15	.20	.040	2.50	3.13	4.27	.88	163.	4.70	4	3.33	2	39.4	S	1	R	1
401	.15	.20	.040	2.50	3.13	4.27	1.27	163.	4.70	4	4.89	4	39.4	S	1	R	1
402	.15	.20	.040	3.75	4.69	4.27	.44	163.	4.70	4	3.33	2	39.4	S	1	R	1
403	.15	.20	.040	2.50	3.13	4.27	0.00	236.	4.70	4	3.70	4	39.4	S	1	R	1
404	.15	.20	.040	2.50	3.13	4.27	.44	236.	4.70	4	3.33	2	39.4	S	1	R	1
405	.15	.20	.040	2.50	3.13	4.27	.88	236.	4.70	4	3.33	2	39.4	S	1	R	1
406	.15	.20	.040	2.50	3.13	4.27	1.27	236.	4.70	4	4.89	4	39.4	S	1	R	1
407	.15	.20	.040	1.25	1.56	4.27	0.00	217.	4.70	4	3.70	4	106.0	S	1	R	1
408	.15	.20	.040	1.25	1.56	4.27	.44	217.	4.70	4	3.33	2	106.0	S	1	R	1
409	.15	.20	.040	1.25	1.56	4.27	.88	217.	4.70	4	3.33	2	106.0	S	1	R	1
410	.15	.20	.040	1.25	1.56	4.27	1.27	217.	4.70	4	4.89	4	106.0	S	1	R	1
411	.15	.20	.040	2.50	3.13	1.32	.44	217.	4.77	4	3.33	2	106.0	S	1	R	1
412	.15	.20	.040	2.50	3.13	2.59	0.00	217.	4.75	4	3.70	4	106.0	S	1	R	1
413	.15	.20	.040	2.50	3.13	2.59	.44	217.	4.75	4	3.33	2	106.0	S	1	R	1
414	.15	.20	.040	2.50	3.13	2.59	.88	217.	4.75	4	3.33	2	106.0	S	1	R	1
415	.15	.20	.040	2.50	3.13	2.59	0.00	217.	4.25	4	3.70	4	106.0	S	1	R	1
416	.15	.20	.040	2.50	3.13	2.59	.44	217.	4.25	4	3.33	2	106.0	S	1	R	1
417	.15	.20	.040	2.50	3.13	2.59	.88	217.	4.25	4	3.33	2	106.0	S	1	R	1
418	.15	.20	.040	2.50	3.13	4.27	0.00	217.	4.70	4	3.70	4	106.0	S	1	R	1
419	.15	.20	.040	2.50	3.13	4.27	.44	217.	4.70	4	3.33	2	106.0	S	1	R	1
420	.15	.20	.040	2.50	3.13	4.27	.88	217.	4.70	4	3.33	2	106.0	S	1	R	1
421	.15	.20	.040	2.50	3.13	4.27	1.27	217.	4.70	4	4.89	4	106.0	S	1	R	1

TABLE A3-10

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
422	.15	.20	.040	3.75	4.69	4.27	.44	217.	4.70	4	3.33	2	106.0	S	1	R	1
423	.15	.20	.040	2.50	3.13	4.27	0.00	356.	4.70	4	3.70	4	106.0	S	1	R	1
424	.15	.20	.040	2.50	3.13	4.27	.44	356.	4.70	4	3.33	2	106.0	S	1	R	1
425	.15	.20	.040	2.50	3.13	4.27	.88	356.	4.70	4	3.33	2	106.0	S	1	R	1
426	.15	.20	.040	2.50	3.13	4.27	1.27	356.	4.70	4	4.89	4	106.0	S	1	R	1
427	.15	.20	.040	1.25	1.56	4.27	0.00	283.	4.70	4	3.70	4	177.0	S	1	R	1
428	.15	.20	.040	1.25	1.56	4.27	.44	283.	4.70	4	3.33	2	177.0	S	1	R	1
429	.15	.20	.040	1.25	1.56	4.27	.88	283.	4.70	4	3.33	2	177.0	S	1	R	1
430	.15	.20	.040	1.25	1.56	4.27	1.27	283.	4.70	4	4.89	4	177.0	S	1	R	1
431	.15	.20	.040	2.50	3.13	1.32	.44	283.	4.77	4	3.33	2	177.0	S	1	R	1
432	.15	.20	.040	2.50	3.13	2.59	0.00	283.	4.75	4	3.70	4	177.0	S	1	R	1
433	.15	.20	.040	2.50	3.13	2.59	.44	283.	4.75	4	3.33	2	177.0	S	1	R	1
434	.15	.20	.040	2.50	3.13	2.59	.84	283.	4.75	4	3.33	2	177.0	S	1	R	1
435	.15	.20	.040	2.50	3.13	2.59	0.00	283.	4.25	4	3.70	4	177.0	S	1	R	1
436	.15	.20	.040	2.50	3.13	2.59	.44	283.	4.25	4	3.33	2	177.0	S	1	R	1
437	.15	.20	.040	2.50	3.13	2.59	.88	283.	4.25	4	3.33	2	177.0	S	1	R	1
438	.15	.20	.040	2.50	3.13	4.27	0.00	283.	4.70	4	3.70	4	177.0	S	1	R	1
439	.15	.20	.040	2.50	3.13	4.27	.44	283.	4.70	4	3.33	2	177.0	S	1	R	1
440	.15	.20	.040	2.50	3.13	4.27	.88	283.	4.70	4	3.33	2	177.0	S	1	R	1
441	.15	.20	.040	2.50	3.13	4.27	1.27	283.	4.70	4	4.89	4	177.0	S	1	R	1
442	.15	.20	.040	3.75	4.69	4.27	.44	283.	4.70	4	3.33	2	177.0	S	1	R	1
443	.15	.20	.040	2.50	3.13	4.27	0.00	381.	4.70	4	3.70	4	177.0	S	1	R	1
444	.15	.20	.040	2.50	3.13	4.27	.44	381.	4.70	4	3.33	2	177.0	S	1	R	1
445	.15	.20	.040	2.50	3.13	4.27	.88	381.	4.70	4	3.33	2	177.0	S	1	R	1
446	.15	.20	.040	2.50	3.13	4.27	1.27	381.	4.70	4	4.89	4	177.0	S	1	R	1
447	.20	.20	.030	2.50	2.94	.63	.33	224.	3.68	1	3.22	2	100.0	S	1	M	1
448	.20	.20	.030	2.50	2.94	.63	.33	224.	3.68	1	3.22	2	100.0	S	2	R	1
449	.20	.20	.030	2.50	2.94	.99	.33	224.	3.64	1	3.22	2	100.0	S	1	M	1
450	.20	.20	.030	2.50	2.94	.99	.33	224.	3.64	1	3.22	2	100.0	S	2	R	1
451	.20	.20	.030	2.50	2.94	1.42	.33	224.	3.65	1	3.22	2	100.0	S	1	M	1
452	.20	.20	.030	2.50	2.94	1.42	.33	224.	3.65	1	3.22	2	100.0	S	2	R	1
453	.20	.20	.030	2.50	2.94	1.94	.33	224.	3.52	1	3.22	2	100.0	S	1	M	1
454	.20	.20	.030	2.50	2.94	1.94	.33	224.	3.52	1	3.22	2	100.0	S	2	R	1
455	.25	.25	.035	1.50	1.74	1.24	2.16	270.	4.01	1	3.50	2	30.0				
456	.25	.25	.035	1.50	1.74	1.24	2.16	270.	4.01	1	3.50	2	30.0				
457	.25	.25	.035	1.50	1.74	1.24	1.44	270.	4.01	1	3.50	2	30.0				
458	.25	.25	.035	1.50	1.74	1.24	1.44	270.	4.01	1	3.50	2	30.0				
459	.25	.25	.035	1.50	1.74	1.24	2.16	240.	4.01	1	3.50	2	30.0				
460	.25	.25	.035	1.50	1.74	1.24	2.16	240.	4.01	1	3.50	2	30.0				
461	.25	.25	.035	1.50	1.74	1.24	1.44	240.	4.01	1	3.50	2	30.0				
462	.25	.25	.035	1.50	1.74	1.24	1.44	240.	4.01	1	3.50	2	30.0				
463	.25	.25	.035	3.00	3.49	1.24	.94	270.	4.01	1	3.62	2	30.0				
464	.25	.25	.035	3.00	3.49	1.24	.94	270.	4.01	1	3.62	2	30.0				
465	.25	.25	.035	3.00	3.49	1.24	.47	270.	4.01	1	3.62	2	30.0				
466	.25	.25	.035	3.00	3.49	1.24	.47	270.	4.01	1	3.62	2	30.0				

TABLE A3-11

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
467	.25	.25	.035	3.00	3.49	1.24	.94	270.	4.01	1	3.62	2	30.0				
468	.25	.25	.035	3.00	3.49	1.24	.94	270.	4.01	1	3.62	2	30.0				
469	.25	.25	.035	3.00	3.49	1.24	.47	270.	4.01	1	3.62	2	30.0				
470	.25	.25	.035	3.00	3.49	1.24	.47	270.	4.01	1	3.62	2	30.0				
471	.25	.25	.035	1.50	1.74	.41	.94	270.	3.78	1	3.62	2	30.0				
472	.25	.25	.035	1.50	1.74	.41	.94	270.	3.78	1	3.62	2	30.0				
473	.25	.25	.035	1.50	1.74	.41	.47	270.	3.78	1	3.62	2	30.0				
474	.25	.25	.035	1.50	1.74	.41	.47	270.	3.78	1	3.62	2	30.0				
476	.25	.25	.035	1.50	1.74	.41	.94	240.	3.78	1	3.62	2	30.0				
478	.25	.25	.035	1.50	1.74	.41	.47	240.	3.78	1	3.62	2	30.0				
479	.25	.25	.035	3.00	3.49	.41	.19	270.	3.78	1	3.77	2	30.0				
480	.25	.25	.035	3.00	3.49	.41	.19	270.	3.78	1	3.77	2	30.0				
481	.25	.25	.035	3.00	3.49	.41	.09	270.	3.78	1	3.77	2	30.0				
482	.25	.25	.035	3.00	3.49	.41	.09	270.	3.78	1	3.77	2	30.0				
483	.25	.25	.035	3.00	3.49	.41	.19	270.	3.78	1	3.77	2	30.0				
484	.25	.25	.035	3.00	3.49	.41	.19	270.	3.78	1	3.77	2	30.0				
485	.25	.25	.035	3.00	3.49	.41	.09	270.	3.78	1	3.77	2	30.0				
486	.25	.25	.035	3.00	3.49	.41	.09	270.	3.78	1	3.77	2	30.0				
487	.25	.25	.035	1.50	1.74	.41	.09	240.	3.78	1	3.77	2	30.0				
488	.25	.25	.035	1.50	1.74	.41	.09	240.	3.78	1	3.77	2	30.0				
489	.25	.25	.035	1.50	1.74	.46	.90	270.	4.07	1	3.77	2	30.0				
490	.25	.25	.035	1.50	1.74	.46	.90	270.	4.07	1	3.77	2	30.0				
491	.25	.25	.035	1.50	1.74	.46	.94	270.	4.07	1	3.62	2	30.0				
492	.25	.25	.035	1.50	1.74	.46	.94	270.	4.07	1	3.62	2	30.0				
493	.25	.25	.035	1.00	1.16	.34	1.54	163.	3.76	1	3.51	2	52.5				
494	.25	.25	.035	2.00	2.33	.34	.72	163.	3.76	1	3.51	2	52.5				
495	.25	.25	.035	2.00	2.33	.34	.36	163.	3.76	1	3.51	2	52.5				
496	.25	.25	.035	1.00	1.16	.34	.92	163.	3.76	1	3.51	2	26.3				
497	.25	.25	.035	1.00	1.16	.34	.45	163.	3.76	1	3.51	2	26.3				
498	.25	.25	.035	2.00	2.33	.34	.18	163.	3.76	1	3.50	2	26.3				
499	.25	.25	.035	2.00	2.33	.34	.09	163.	3.76	1	3.50	2	26.3				
500	.25	.25	.035	1.00	1.16	.61	2.32	163.	3.87	1	3.18	2	26.3				
501	.25	.25	.035	1.00	1.16	.61	1.13	163.	3.87	1	3.51	2	26.3				
502	.25	.25	.035	2.00	2.33	.61	.51	163.	3.87	1	3.51	2	26.3				
503	.25	.25	.035	2.00	2.33	.61	.27	163.	3.87	1	3.50	2	26.3				
504	.25	.25	.035	2.00	2.33	.96	2.43	163.	3.71	1	3.18	2	52.5				
505	.25	.25	.035	2.00	2.33	.96	1.23	163.	3.71	1	3.51	2	52.5				
506	.25	.25	.035	2.00	2.33	.96	1.28	163.	3.71	1	3.51	2	26.3				
507	.25	.25	.035	2.00	2.33	.96	.61	163.	3.71	1	3.51	2	26.3				
508	.25	.25	.035	1.00	1.16	.34	1.44	245.	3.76	1	3.51	2	52.5				
509	.25	.25	.035	2.00	2.33	.34	.67	245.	3.76	1	3.51	2	52.5				
510	.25	.25	.035	2.00	2.33	.34	.36	245.	3.76	1	3.54	2	52.5				
511	.25	.25	.035	1.00	1.16	.34	.86	245.	3.76	1	3.51	2	26.3				
512	.25	.25	.035	1.00	1.16	.34	.45	245.	3.76	1	3.54	2	26.3				
513	.25	.25	.035	2.00	2.33	.34	.18	245.	3.76	1	3.77	2	26.3				

TABLE A3-12

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
514	.25	.25	.035	2.00	2.33	.34	.09	245.	3.76	1	3.77	2	26.3				
515	.25	.25	.035	1.00	1.16	.61	2.23	245.	3.95	1	3.31	2	26.3				
516	.25	.25	.035	1.00	1.16	.61	1.05	245.	3.95	1	3.51	2	26.3				
517	.25	.25	.035	2.00	2.33	.61	.51	245.	3.95	1	3.54	2	26.3				
518	.25	.25	.035	2.00	2.33	.61	.27	245.	3.95	1	3.77	2	26.3				
519	.25	.25	.035	2.00	2.33	.96	2.34	245.	3.69	1	3.31	2	52.5				
520	.25	.25	.035	2.00	2.33	.96	1.15	245.	3.69	1	3.51	2	52.5				
521	.25	.25	.035	2.00	2.33	.96	1.20	245.	3.69	1	3.51	2	26.3				
522	.25	.25	.035	2.00	2.33	.96	.61	245.	3.69	1	3.54	2	26.3				
523	.50	.50	.070	1.00	1.16	.34	1.80	265.	3.61	1	2.93	2	52.5				
524	.50	.50	.070	2.00	2.33	.34	.85	265.	3.61	1	2.93	2	52.5				
525	.50	.50	.070	2.00	2.33	.34	.41	265.	3.61	1	3.05	2	52.5				
526	.50	.50	.070	1.00	1.16	.34	1.02	265.	3.61	1	2.93	2	26.3				
527	.50	.50	.070	1.00	1.16	.34	.46	265.	3.61	1	3.05	2	26.3				
528	.50	.50	.070	2.00	2.33	.34	.19	265.	3.61	1	3.47	2	26.3				
529	.50	.50	.070	2.00	2.33	.34	.10	265.	3.61	1	3.47	2	26.3				
530	.50	.50	.070	1.00	1.16	.61	1.36	265.	3.63	1	2.93	2	26.3				
531	.50	.50	.070	2.00	2.33	.61	.59	265.	3.63	1	3.05	2	26.3				
532	.50	.50	.070	2.00	2.33	.61	.49	265.	3.63	1	3.05	2	26.3				
533	.50	.50	.070	2.00	2.33	.61	.41	265.	3.63	1	3.05	2	26.3				
534	.50	.50	.070	2.00	2.33	.61	.26	265.	3.63	1	3.47	2	26.3				
535	.50	.50	.070	2.00	2.33	.95	1.41	265.	3.58	1	2.93	2	52.5				
536	.50	.50	.070	2.00	2.33	.95	1.46	265.	3.58	1	2.93	2	26.3				
537	.50	.50	.070	2.00	2.33	.95	.73	265.	3.58	1	3.05	2	26.3				
538	.25	.25	.035	1.00	1.16	.34	.91	453.	3.76	1	3.50	2	52.5				
539	.25	.25	.035	2.00	2.33	.34	.40	453.	3.76	1	3.51	2	52.5				
540	.25	.25	.035	2.00	2.33	.34	.21	453.	3.76	1	3.50	2	52.5				
541	.25	.25	.035	1.00	1.16	.34	.24	453.	3.76	1	3.50	2	26.3				
542	.25	.25	.035	1.00	1.16	.34	.12	453.	3.76	1	3.50	2	26.3				
543	.25	.25	.035	2.00	2.33	.34	.05	453.	3.76	1	3.50	2	26.3				
544	.25	.25	.035	1.00	1.16	.61	1.11	453.	4.31	1	3.50	2	26.3				
545	.25	.25	.035	1.00	1.16	.61	.57	453.	4.31	1	3.51	2	26.3				
546	.25	.25	.035	2.00	2.33	.61	.22	453.	4.31	1	3.50	2	26.3				
547	.25	.25	.035	2.00	2.33	.61	.11	453.	4.31	1	3.50	2	26.3				
548	.25	.25	.035	2.00	2.33	.96	1.55	453.	3.71	1	3.50	2	52.5				
549	.25	.25	.035	2.00	2.33	.96	.76	453.	3.71	1	3.50	2	52.5				
550	.25	.25	.035	2.00	2.33	.96	.57	453.	3.71	1	3.51	2	26.3				
551	.25	.25	.035	2.00	2.33	.96	.29	453.	3.71	1	3.50	2	26.3				
552	.25	.25	.035	1.00	1.16	.34	1.23	274.	3.76	1	3.76	1	52.5				
553	.25	.25	.035	1.00	1.16	.34	.36	274.	3.76	1	3.49	1	26.3				
554	.25	.25	.035	2.00	2.33	.34	.78	274.	3.76	1	3.49	1	70.1				
555	.25	.25	.035	2.00	2.33	.34	.38	274.	3.76	1	3.49	1	70.1				
556	.25	.25	.035	2.00	2.33	.34	.57	274.	3.76	1	3.49	1	52.5				
557	.25	.25	.035	2.00	2.33	.34	.28	274.	3.76	1	3.49	1	52.5				
558	.25	.25	.035	1.00	1.16	.61	2.42	274.	4.28	1	3.24	1	52.5				

TABLE A3-13

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
559	.25	.25	.035	1.00	1.16	.61	1.14	274.	4.28	1	3.76	1	26.2				
560	.25	.25	.035	2.00	2.33	.61	1.49	274.	4.28	1	3.76	1	70.1				
561	.25	.25	.035	2.00	2.33	.61	1.14	274.	4.28	1	3.76	1	52.5				
562	.25	.25	.035	2.00	2.33	.61	.57	274.	4.28	1	3.49	1	52.5				
563	.25	.25	.035	2.00	2.33	.61	.51	274.	4.28	1	3.49	1	26.2				
564	.25	.25	.035	2.00	2.33	.61	.26	274.	4.28	1	3.49	1	26.2				
565	.25	.25	.035	2.00	2.33	.96	.85	274.	3.71	1	3.76	1	52.5				
566	.25	.25	.035	2.00	2.33	.96	.46	274.	3.71	1	3.49	1	26.2				
594	.25	.25	.035	1.00	1.16	.61	.21	190.	3.78	1	4.00	2	0.0				
595	.25	.25	.035	2.00	2.33	.61	.60	190.	3.78	1	3.35	2	70.0				
596	.25	.25	.035	1.00	1.16	.96	.21	190.	3.60	1	4.00	2	-21.0				
597	.25	.25	.035	1.00	1.16	.96	.98	190.	3.60	1	3.35	2	0.0				
598	.25	.25	.035	1.00	1.16	.96	.51	190.	3.60	1	3.68	2	0.0				
599	.25	.25	.035	2.00	2.33	.96	.45	190.	3.60	1	3.68	2	0.0				
600	.25	.25	.035	2.00	2.33	.96	1.59	190.	3.60	1	3.15	2	70.0				
601	.25	.25	.035	2.00	2.33	.96	.79	190.	3.60	1	3.35	2	70.0				
602	.25	.25	.035	1.00	1.16	1.38	.76	190.	3.54	1	3.35	2	-21.0				
603	.25	.25	.035	1.00	1.16	1.38	.40	190.	3.54	1	3.68	2	-21.0				
604	.25	.25	.035	2.00	2.33	1.38	.16	190.	3.54	1	4.00	2	-21.0				
605	.25	.25	.035	1.00	1.16	1.38	2.06	190.	3.54	1	3.15	2	0.0				
606	.25	.25	.035	2.00	2.33	1.38	.92	190.	3.54	1	3.35	2	0.0				
607	.25	.25	.035	2.00	2.33	1.38	.48	190.	3.54	1	3.68	2	0.0				
608	.25	.25	.035	2.00	2.33	1.38	2.35	190.	3.54	1	3.15	2	70.0				
609	.25	.25	.035	1.50	1.74	.61	2.18	193.	3.63	1	3.18	2	52.5				
610	.25	.25	.035	1.50	1.74	.61	1.03	193.	3.63	1	3.59	2	52.5				
611	.25	.25	.035	1.50	1.74	.61	.84	193.	3.63	1	3.59	2	26.3				
612	.25	.25	.035	1.50	1.74	.61	.45	193.	3.63	1	3.85	2	26.3				
613	.25	.25	.035	1.50	1.74	.34	1.16	193.	3.82	1	3.59	2	52.5				
614	.25	.25	.035	1.50	1.74	.34	.60	193.	3.82	1	3.85	2	52.5				
615	.25	.25	.035	1.50	1.74	.34	.29	193.	3.82	1	3.89	2	26.3				
616	.25	.25	.035	1.50	1.74	.34	.15	193.	3.82	1	3.89	2	26.3				
617	.25	.25	.035	3.00	3.49	.96	.93	193.	3.56	1	3.59	2	52.5				
618	.25	.25	.035	3.00	3.49	.96	.49	193.	3.56	1	3.85	2	52.5				
619	.25	.25	.035	3.00	3.49	.96	.51	193.	3.56	1	3.85	2	26.3				
620	.25	.25	.035	3.00	3.49	.96	.25	193.	3.56	1	3.89	2	26.3				
621	.25	.25	.035	3.00	3.49	.61	.52	193.	3.63	1	3.85	2	52.5				
622	.25	.25	.035	3.00	3.49	.61	.26	193.	3.63	1	3.89	2	52.5				
623	.25	.25	.035	3.00	3.49	.61	.20	193.	3.63	1	3.89	2	26.3				
624	.25	.25	.035	3.00	3.49	.61	.28	193.	3.63	1	3.89	2	52.5				
625	.25	.25	.035	1.50	1.74	.96	1.03	193.	3.56	1	3.59	2	26.3				
626	.25	.25	.035	1.00	1.16	.34	1.44	270.	3.82	1	3.41	2	52.5				
627	.25	.25	.035	1.00	1.16	.34	1.44	270.	3.82	1	3.47	2	52.5				
628	.25	.25	.063	1.00	1.34	.45	1.44	270.	3.82	1	3.41	2	52.5				
629	.25	.25	.035	2.00	2.33	.34	.35	322.	3.82	1	3.73	2	52.5				
630	.25	.25	.035	2.00	2.33	.34	.34	322.	3.82	1	3.77	2	52.5				

TABLE A3-14

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
631	.25	.25	.063	2.00	2.67	.45	.35	322.	3.82	1	3.73	2	52.5				
632	.25	.25	.035	1.00	1.16	.61	1.08	270.	3.89	1	3.41	2	26.3				
633	.25	.25	.035	1.00	1.16	.61	1.08	270.	3.89	1	3.47	2	26.3				
634	.25	.25	.063	1.00	1.34	.81	1.08	270.	3.89	1	3.41	2	26.3				
635	.25	.25	.035	2.00	2.33	.61	.25	322.	3.89	1	3.94	2	26.3				
636	.25	.25	.035	2.00	2.33	.61	.25	322.	3.89	1	3.94	2	26.3				
637	.25	.25	.063	2.00	2.67	.81	.25	322.	3.89	1	3.94	2	26.3				
638	.25	.25	.035	2.00	2.33	.96	1.18	322.	3.52	1	3.41	2	52.5				
639	.25	.25	.035	2.00	2.33	.96	1.21	322.	3.52	1	3.47	2	52.5				
640	.25	.25	.063	2.00	2.67	1.27	1.18	322.	3.52	1	3.41	2	52.5				
641	.25	.25	.035	2.00	2.33	.34	.41	210.	3.83	1	3.67	2	35.0				
642	.25	.25	.035	2.00	2.33	.34	.41	210.	3.83	1	3.67	2	35.0				
643	.25	.25	.035	2.00	2.33	.34	.41	210.	3.83	1	3.67	2	35.0				
645	.30	.30	.050	2.00	2.40	1.13	2.12	303.	3.85	1	3.60	2	60.0				
646	.30	.30	.050	2.00	2.40	1.13	2.12	303.	3.85	1	3.60	2	60.0				
647	.30	.30	.053	2.00	2.43	1.13	2.12	303.	3.85	1	3.60	2	60.0				
648	.30	.30	.065	2.00	2.55	1.13	2.12	303.	3.85	1	3.60	2	60.0				
649	.30	.30	.050	2.00	2.40	1.13	2.13	303.	3.85	1	3.60	2	60.0				
650	.30	.30	.050	2.00	2.40	1.13	2.12	303.	3.85	1	3.60	2	60.0				
651	.30	.30	.050	2.00	2.40	1.13	2.12	303.	3.85	1	3.60	2	60.0				
652	.30	.30	.050	2.00	2.40	1.13	2.12	303.	3.85	1	3.60	2	60.0				
653	.30	.30	.047	2.00	2.37	1.16	2.12	325.	3.80	1	3.60	2	60.0				
654	.30	.30	.050	2.00	2.40	1.16	2.12	325.	3.80	1	3.60	2	60.0				
655	.30	.30	.052	2.00	2.42	1.16	2.12	325.	3.80	1	3.60	2	60.0				
656	.30	.30	.066	2.00	2.56	1.16	2.12	325.	3.80	1	3.60	2	60.0				
657	.30	.30	.048	2.00	2.38	1.16	2.12	325.	3.80	1	3.60	2	60.0				
658	.30	.30	.048	2.00	2.38	1.16	2.12	325.	3.80	1	3.60	2	60.0				
659	.30	.30	.048	2.00	2.38	1.16	2.12	325.	3.80	1	3.60	2	60.0				
660	.25	.25	.036	1.99	2.32	.60	.58	219.	4.23	1	2.89	2	25.9				
661	.25	.25	.036	1.99	2.32	.60	.58	223.	4.23	1	2.89	2	26.0				
662	.25	.25	.036	2.48	2.89	.60	.36	227.	4.23	1	2.89	2	25.8				
663	.25	.25	.036	2.49	2.91	.60	.37	198.	4.23	1	2.89	2	26.0				
664	.25	.25	.036	2.48	2.89	.60	.58	219.	4.23	1	2.89	2	51.9				
665	.25	.25	.036	2.48	2.89	.60	.58	228.	4.23	1	2.89	2	51.7				
666	.25	.25	.036	2.98	3.48	.60	.25	215.	4.23	1	2.89	2	25.9				
667	.25	.25	.036	2.98	3.48	.60	.25	220.	4.23	1	2.89	2	25.9				
668	.25	.25	.037	2.95	3.45	.60	.40	224.	4.23	1	2.89	2	51.5				
669	.25	.25	.037	2.95	3.45	.60	.40	211.	4.23	1	2.89	2	51.5				
670	.25	.25	.036	2.96	3.45	.94	.59	244.	4.06	1	2.89	2	25.7				
671	.25	.25	.036	2.99	3.49	.95	.59	222.	4.06	1	2.89	2	26.0				
672	.25	.25	.035	1.50	1.74	.64	.79	124.	3.56	1	3.54	2	26.3				
673	.25	.25	.035	1.50	1.74	.57	.78	124.	3.97	1	3.49	2	26.3				
674	.25	.25	.035	1.50	1.74	.57	.79	153.	3.97	1	3.54	2	26.3				
675	.25	.25	.035	1.50	1.74	.92	1.74	153.	3.64	1	3.54	2	26.3				
676	.25	.25	.035	1.50	1.74	1.02	1.69	153.	3.90	1	3.49	2	26.3				

TABLE A3-15

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
677	.25	.25	.035	1.50	1.74	1.02	1.74	124.	3.90	1	3.54	2	26.3				
678	.25	.25	.035	2.00	2.33	.64	.45	124.	3.56	1	3.70	2	26.3				
679	.25	.25	.035	2.00	2.33	.64	.46	153.	3.56	1	3.71	2	26.3				
680	.25	.25	.035	2.00	2.33	.57	.45	153.	3.97	1	3.70	2	26.3				
681	.25	.25	.035	2.00	2.33	.92	.69	153.	3.64	1	3.49	2	26.3				
682	.25	.25	.035	2.00	2.33	.92	.88	124.	3.64	1	3.54	2	26.3				
683	.25	.25	.035	2.00	2.33	1.02	1.24	124.	3.90	1	3.49	2	26.3				
684	.25	.25	.035	2.00	2.33	1.02	.88	153.	3.90	1	3.54	2	26.3				
685	.25	.25	.035	1.00	1.16	.34	.41	225.	3.83	1	2.96	2	20.0				
686	.25	.25	.035	1.00	1.16	.61	.86	213.	4.18	1	2.96	2	20.0				
687	.25	.25	.035	1.00	1.16	.61	.43	232.	4.18	1	2.96	2	20.0				
688	.25	.25	.035	1.00	1.16	.96	1.40	239.	3.87	1	2.76	2	20.0				
689	.25	.25	.035	1.00	1.16	.34	.71	264.	3.83	1	2.96	2	40.0				
690	.25	.25	.035	1.00	1.16	.61	1.20	251.	4.18	1	2.76	2	40.0				
691	.25	.25	.035	1.00	1.16	.34	.86	238.	3.83	1	2.96	2	60.0				
692	.25	.25	.035	1.00	1.16	.61	1.34	252.	4.18	1	2.76	2	60.0				
693	.25	.25	.035	1.50	1.74	.34	.26	210.	3.83	1	2.96	2	20.0				
694	.25	.25	.035	1.50	1.74	.61	.56	257.	4.18	1	2.96	2	20.0				
695	.25	.25	.035	1.50	1.74	.61	.28	233.	4.18	1	2.96	2	20.0				
696	.25	.25	.035	1.50	1.74	.96	.86	230.	3.87	1	2.96	2	20.0				
697	.25	.25	.035	1.50	1.74	.34	.45	238.	3.83	1	2.96	2	40.0				
698	.25	.25	.035	1.50	1.74	.61	.73	261.	4.18	1	2.96	2	40.0				
699	.25	.25	.035	1.50	1.74	.34	.56	219.	3.83	1	2.96	2	60.0				
700	.25	.25	.035	1.50	1.74	.61	.81	220.	4.18	1	2.96	2	60.0				
701	.25	.25	.035	2.00	2.33	.61	.42	227.	4.18	1	2.96	2	20.0				
702	.25	.25	.035	2.00	2.33	.61	.21	235.	4.18	1	2.96	2	20.0				
703	.25	.25	.035	2.00	2.33	.96	.63	233.	3.87	1	2.96	2	20.0				
704	.25	.25	.035	2.00	2.33	.61	.51	238.	4.18	1	2.96	2	20.0				
705	.25	.25	.035	2.00	2.33	.61	.42	226.	4.18	1	2.96	2	20.0				
706	.25	.25	.035	2.00	2.33	.34	.34	233.	3.83	1	2.96	2	40.0				
707	.25	.25	.035	2.00	2.33	.61	.54	203.	4.18	1	2.96	2	40.0				
708	.25	.25	.035	2.00	2.33	.61	.63	217.	4.18	1	2.96	2	40.0				
709	.25	.25	.035	2.00	2.33	.61	.54	236.	4.18	1	2.96	2	40.0				
710	.25	.25	.035	2.00	2.33	.34	.42	230.	3.83	1	2.96	2	60.0				
711	.25	.25	.035	2.00	2.33	.61	.60	209.	4.18	1	2.96	2	60.0				
712	.25	.25	.035	2.00	2.33	.34	.34	240.	4.13	1	4.55	2	52.5				
713	.25	.25	.035	2.00	2.33	.34	.34	240.	4.13	1	4.55	2	52.5				
714	.25	.25	.035	2.00	2.33	.34	.34	240.	4.13	1	4.55	2	52.5				
715	.25	.25	.035	2.00	2.33	.61	.45	240.	4.27	1	4.55	2	26.3				
716	.25	.25	.035	2.00	2.33	.61	.27	240.	4.27	1	3.79	2	26.3				
717	.25	.25	.035	2.00	2.33	.96	1.16	240.	3.95	1	3.43	2	52.5				
718	.25	.25	.035	2.00	2.33	.96	1.21	240.	3.95	1	3.43	2	26.3				
719	.25	.25	.035	2.00	2.33	.96	.57	240.	3.95	1	4.55	2	26.3				
720	.25	.25	.035	2.00	2.33	.96	.57	240.	3.95	1	4.55	2	26.3				
721	.25	.25	.035	2.00	2.33	.96	.57	240.	3.95	1	4.55	2	26.3				

TABLE A3-16

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
722	.25	.25	.035	1.00	1.16	.34	.92	146.	3.87	1	3.42	2	26.3				
723	.25	.25	.035	1.00	1.16	.34	.92	146.	3.87	1	3.42	2	26.3				
724	.25	.25	.035	1.00	1.16	.34	.45	146.	3.99	1	3.42	2	26.3				
725	.25	.25	.035	1.00	1.16	.34	.45	146.	3.99	1	3.42	2	26.3				
726	.25	.25	.035	1.00	1.16	.34	.45	146.	3.99	1	3.42	2	26.3				
727	.25	.25	.035	1.00	1.16	.34	.45	146.	3.99	1	3.42	2	26.3				
728	.25	.25	.035	1.00	1.16	.31	.20	180.	4.04	2	3.77	2	26.4				
729	.25	.25	.035	2.00	2.33	.31	.20	140.	4.04	2	3.77	2	26.4				
730	.25	.25	.035	1.00	1.16	.64	1.06	140.	3.61	2	3.77	2	26.4				
731	.25	.25	.035	2.00	2.33	.64	.19	140.	3.61	2	4.04	2	26.4				
732	.25	.25	.035	2.00	2.33	.97	.61	180.	3.40	2	5.16	2	52.8				
733	.25	.25	.035	2.00	2.33	.97	.48	180.	3.40	2	5.16	2	26.4				
734	.25	.25	.035	2.00	2.33	.92	1.02	261.	3.76	1	3.14	2	26.3				
735	.25	.25	.035	2.00	2.33	.92	1.02	261.	3.76	1	3.14	2	52.5				
736	.25	.25	.035	2.00	2.33	.92	.87	261.	3.76	1	3.14	2	26.3				
						.17				3.44							
737	.25	.25	.035	2.00	2.33	.92	.87	261.	3.76	1	3.14	2	52.5				
						.17				3.44							
738	.25	.25	.035	2.00	2.33	1.02	1.02	261.	4.03	1	3.14	2	26.3				
739	.25	.25	.035	2.00	2.33	1.02	1.02	261.	4.03	1	3.14	2	52.5				
740	.25	.25	.035	2.00	2.33	1.02	.87	261.	4.03	1	3.14	2	26.3				
						.17				3.44							
741	.25	.25	.035	2.00	2.33	1.02	.87	261.	4.03	1	3.14	2	52.5				
						.17				3.44							
742	.25	.25	.035	2.00	2.33	.64	.70	261.	3.88	1	3.72	2	26.3				
743	.25	.25	.035	2.00	2.33	.64	.70	261.	3.88	1	3.72	2	52.5				
744	.25	.25	.035	2.00	2.33	.64	.50	261.	3.88	1	3.72	2	26.3				
						.22				3.44							
745	.25	.25	.035	2.00	2.33	.64	.50	261.	3.88	1	3.72	2	52.5				
						.22				3.44							
746	.25	.25	.035	2.00	2.33	.57	.70	261.	3.83	1	3.72	2	26.3				
747	.25	.25	.035	2.00	2.33	.57	.70	261.	3.83	1	3.72	2	52.5				
748	.25	.25	.035	2.00	2.33	.57	.50	261.	3.83	1	3.72	2	26.3				
						.22				3.44							
749	.25	.25	.035	2.00	2.33	.57	.50	261.	3.83	1	3.72	2	52.5				
						.22				3.44							
750	.25	.25	.035	1.99	2.31	.61	.57	215.	4.18	1	2.89	2	26.3				
751	.25	.25	.035	2.49	2.89	.61	.36	205.	4.18	1	2.89	2	26.3				
752	.25	.25	.035	2.50	2.91	.61	.76	207.	4.02	1	2.89	2	52.5				
753	.25	.25	.035	3.00	3.49	.61	.25	217.	4.18	1	2.89	2	26.3				
754	.25	.25	.035	3.00	3.49	.61	.53	185.	4.02	1	2.89	2	52.5				
755	.25	.25	.035	3.00	3.49	.95	.60	189.	4.05	1	2.89	2	26.3				
756	.25	.25	.035	2.00	2.33	.61	.50	245.	4.02	1	2.89	2	35.0				
757	.25	.25	.035	2.00	2.33	.61	.50	234.	4.02	1	2.89	2	35.0				
758	.25	.25	.035	2.50	2.91	.34	.18	231.	4.22	1	2.89	2	35.0				
759	.25	.25	.035	2.50	2.91	.34	.18	242.	4.22	1	2.89	2	35.0				
760	.25	.25	.035	2.50	2.91	.34	.18	236.	4.02	1	2.89	2	20.0				
761	.25	.25	.035	2.50	2.91	.34	.18	232.	4.02	1	2.89	2	20.0				
762	.25	.25	.035	2.50	2.91	.34	.32	226.	4.02	1	2.89	2	35.0				
763	.25	.25	.035	2.50	2.91	.34	.32	236.	4.02	1	2.89	2	35.0				
764	.25	.25	.035	2.50	2.91	.34	.50	246.	4.02	1	2.89	2	50.0				
765	.25	.25	.035	2.50	2.91	.34	.50	241.	4.02	1	2.89	2	50.0				
766	.25	.25	.035	2.50	2.91	.95	.36	237.	3.66	1	2.89	2	20.0				

TABLE A3-17

PROPERTIES OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
767	.25	.25	.035	2.50	2.91	.95	.36	237.	3.66	1	2.89	2	20.0				
768	.25	.25	.035	2.50	2.91	.95	.36	232.	3.66	1	2.89	2	20.0				
769	.25	.25	.035	2.50	2.91	.95	.36	242.	3.66	1	2.89	2	20.0				
770	.25	.25	.035	2.50	2.91	.95	.60	210.	3.66	1	2.89	2	35.0				
771	.25	.25	.035	2.50	2.91	.95	.60	209.	3.66	1	2.89	2	35.0				
772	.25	.25	.035	3.00	3.49	.61	.22	210.	4.02	1	2.89	2	35.0				
773	.25	.25	.035	3.00	3.49	.61	.22	222.	4.02	1	2.89	2	35.0				
774	.25	.25	.035	2.00	2.33	.34	.75	241.	4.46	1	3.80	2	70.0				
775	.25	.25	.035	2.00	2.33	.34	.75	241.	4.46	1	3.80	2	105.0				
776	.25	.25	.035	2.00	2.33	.34	.75	241.	4.46	1	3.80	2	140.0				
777	.25	.25	.035	2.00	2.33	.61	1.70	241.	4.41	1	3.35	2	105.0				
778	.25	.25	.035	2.00	2.33	.61	.75	241.	4.41	1	3.80	2	105.0				
779	.25	.25	.035	2.00	2.33	.61	1.70	241.	4.41	1	3.35	2	140.0				
780	.25	.25	.035	2.00	2.33	.61	.75	241.	4.41	1	3.80	2	140.0				
781	.40	.40	.040	1.50	1.67	.61	1.77	277.	3.67	1	3.35	2	60.0				
782	.40	.40	.040	2.00	2.22	.61	.95	277.	3.66	1	3.06	2	80.0				
783	.40	.40	.040	2.00	2.22	.99	1.11	277.	3.59	1	3.06	2	60.0				
784	.40	.40	.040	2.00	2.22	.99	1.22	277.	3.24	1	3.10	2	80.0				
785	.40	.40	.040	2.00	2.22	.99	2.66	277.	3.24	1	3.76	2	80.0				
786	.25	.25	.035	1.50	1.74	.31	.41	263.	3.33	2	2.40	2	26.3				
787	.25	.25	.035	1.50	1.74	.64	.95	263.	3.36	2	3.33	2	26.3				
788	.25	.25	.035	1.50	1.74	.96	1.22	263.	4.06	2	3.33	2	26.3				
789	.25	.25	.035	2.00	2.33	.31	.21	263.	3.33	2	4.22	2	26.3				
790	.25	.25	.035	2.00	2.33	.64	.54	263.	3.36	2	2.40	2	26.3				
791	.25	.25	.035	2.00	2.33	.96	.90	263.	4.06	2	3.33	2	26.3				

READY.

LEGEND FOR TABLE A4

(1) mark

(2) load at flexural cracking, tons

(3) load at flexure-shear cracking

(4) load at shear cracking, tons

(5) load at bond splitting, tons

(6) yield load, tons

(7) maximum load, tons

(8) For items 1 through 15
STF: Shear tension failure (a shear failure similar to a shear-compression failure but with limited or no crushing of the concrete)
SCF: Shear-compression failure

For items 455-791
F and FL: Flexural failure (Dr. Hirosawa's reasons for distinguishing between F and FL could not be established from the available evidence)
FC: compressive flexural failure before uielding of tension reinforcement
S: Shear failure
B and BO: Bond failure
BU: Buckling of longitudinal reinforcement
SC: Shear-compression failure
ST: Shear-tension failure
SDT: diagonal-tension failure
W: fracture of web reinforcement
( ): uncertain

TABLE A4-1

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMM)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	0.00	0.00	3.60	0.00	0.00	6.30	STF
2	0.00	0.00	2.20	0.00	0.00	4.03	STF
3	0.00	0.00	1.75	0.00	0.00	1.85	STF
4	0.00	0.00	1.60	0.00	0.00	1.60	STF
5	0.00	0.00	8.00	0.00	0.00	8.60	SCF
6	0.00	0.00	6.30	0.00	0.00	6.70	STF
7	0.00	0.00	3.80	0.00	0.00	4.30	STF
8	0.00	0.00	3.20	0.00	0.00	3.30	STF
9	0.00	0.00	3.30	0.00	0.00	6.40	STF
10	0.00	0.00	2.40	0.00	0.00	4.85	STF
11	0.00	0.00	1.80	0.00	0.00	3.00	STF
12	0.00	0.00	1.80	0.00	0.00	1.90	SCF
13	0.00	0.00	7.60	0.00	0.00	7.90	SCF
14	0.00	0.00	6.00	0.00	0.00	6.00	SCF
15	0.00	0.00	4.10	0.00	0.00	4.20	SCF
16	0.00	0.00	2.95	0.00	0.00	3.00	
17	0.00	0.00	4.15	0.00	0.00	7.00	
18	0.00	0.00	2.65	0.00	0.00	3.45	
19	0.00	0.00	1.80	0.00	0.00	2.00	
20	0.00	0.00	1.85	0.00	0.00	1.85	
21	0.00	0.00	1.70	0.00	0.00	2.67	
22	0.00	0.00	1.85	0.00	0.00	2.72	
23	0.00	0.00	4.60	0.00	0.00	4.95	
24	0.00	0.00	4.25	0.00	0.00	4.45	
25	0.00	0.00	4.40	0.00	0.00	5.05	
26	0.00	0.00	4.20	0.00	0.00	5.00	
27	0.00	0.00	3.06	0.00	0.00	4.02	
28	0.00	0.00	4.20	0.00	0.00	4.60	
29	0.00	0.00	1.80	0.00	1.90	2.02	
30	0.00	0.00	1.90	0.00	0.00	2.00	
31	0.00	0.00	1.90	0.00	2.00	2.05	
32	0.00	0.00	1.60	0.00	0.00	2.00	
33	0.00	0.00	1.67	0.00	0.00	1.97	
34	0.00	0.00	1.60	0.00	0.00	2.00	
35	0.00	0.00	0.00	0.00	0.00	3.25	
36	0.00	0.00	0.00	0.00	0.00	3.22	
37	0.00	0.00	0.00	0.00	0.00	3.40	
38	0.00	0.00	0.00	0.00	0.00	3.72	
39	0.00	0.00	0.00	0.00	3.22	3.47	
40	0.00	0.00	0.00	0.00	0.00	3.40	
41	1.25	0.00	3.50	0.00	5.30	5.70	
42	1.50	0.00	3.50	0.00	5.10	5.65	
43	2.50	0.00	4.00	0.00	6.10	7.55	
44	2.50	0.00	4.50	0.00	6.50	7.80	
45	3.00	0.00	5.00	0.00	7.50	8.40	

TABLE A4-2

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
46	3.00	0.00	4.75	0.00	8.00	8.20	
47	4.00	0.00	6.00	0.00	8.25	8.85	
48	3.00	0.00	5.25	0.00	8.00	8.25	
49	1.50	0.00	3.00	0.00	5.40	5.80	
50	1.50	0.00	3.50	0.00	5.30	6.00	
51	2.00	0.00	4.00	0.00	6.50	7.50	
52	2.00	0.00	4.00	0.00	6.30	7.00	
53	2.50	0.00	5.75	0.00	8.30	8.50	
54	3.00	0.00	5.75	0.00	8.00	8.80	
55	3.50	0.00	6.25	0.00	9.00	9.60	
56	3.50	0.00	6.00	0.00	9.00	9.40	
57	4.50	0.00	7.00	0.00	9.50	10.35	
58	4.00	0.00	6.00	0.00	9.00	10.20	
59	1.50	0.00	3.00	0.00	4.20	4.65	
60	1.50	0.00	3.00	0.00	4.35	4.40	
61	2.50	0.00	4.20	0.00	5.60	5.85	
62	2.00	0.00	4.50	0.00	5.60	5.90	
63	3.50	0.00	6.00	0.00	6.50	7.00	
64	3.00	0.00	5.50	0.00	6.50	7.00	
65	3.50	0.00	6.50	0.00	7.50	8.10	
66	4.00	0.00	8.00	0.00	9.00	8.20	
67	1.00	0.00	3.55	0.00	4.90	5.00	
68	2.00	0.00	3.00	0.00	5.00	5.70	
69	3.75	0.00	5.50	0.00	7.70	8.40	
70	4.00	0.00	5.50	0.00	8.00	8.65	
71	4.50	0.00	8.15	0.00	8.50	9.65	
72	3.00	0.00	6.00	0.00	7.50	8.65	
73	4.50	0.00	8.50	0.00	8.90	10.00	
74	4.50	0.00	8.50	0.00	9.75	10.00	
75	1.00	0.00	3.50	0.00	3.80	5.10	
76	.75	0.00	3.70	0.00	3.50	3.90	
77	.50	0.00	2.50	0.00	2.75	5.30	
78	.25	0.00	2.50	0.00	2.90	3.10	
79	2.50	5.00	5.75	0.00	6.00	6.20	
80	2.50	5.00	5.00	0.00	6.80	7.05	
81	3.00	6.00	7.00	0.00	8.75	8.95	
82	3.50	6.00	8.00	0.00	11.50	11.80	
83	3.50	5.00	7.20	0.00	6.50	7.25	
84	4.00	4.50	7.25	0.00	9.75	9.75	
85	3.50	5.00	7.00	0.00	10.00	10.75	
86	4.25	7.25	7.80	0.00	8.50	9.00	
87	6.00	7.50	8.40	0.00	9.50	10.10	
88	4.50	8.00	9.00	0.00	11.50	11.90	
89	5.00	8.00	11.25	0.00	11.00	11.30	
90	3.50	4.50	6.50	0.00	7.75	8.35	

TABLE A4-3

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUNM)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
91	3.50	6.00	7.00	0.00	10.50	10.75	
92	3.50	6.00	7.00	0.00	11.25	11.65	
93	5.50	7.50	9.78	0.00	10.00	10.00	
94	5.15	7.50	9.00	0.00	11.00	12.50	
95	5.25	7.50	10.00	0.00	13.00	13.65	
96	4.50	7.50	10.00	0.00	14.00	14.50	
97	3.00	5.50	6.00	0.00	7.50	7.65	
98	3.00	6.00	6.50	0.00	9.00	9.75	
99	3.00	6.00	6.00	0.00	11.00	11.25	
100	4.50	9.00	10.00	0.00	10.00	10.40	
101	5.00	8.00	9.00	0.00	12.00	12.35	
102	5.00	9.00	10.00	0.00	12.00	13.20	
103	3.50	5.00	8.00	0.00	13.00	13.50	
104	3.00	5.00	6.00	0.00	7.50	8.70	
105	3.00	5.00	5.50	0.00	8.00	8.50	
106	2.50	5.00	6.00	0.00	11.00	11.50	
107	5.00	8.00	8.50	0.00	10.00	10.50	
108	4.00	7.00	9.00	0.00	11.00	11.20	
109	4.50	8.00	9.00	0.00	12.50	13.50	
110	3.50	6.00	7.00	0.00	13.00	13.70	
111	1.85	0.00	6.35	0.00	17.00	17.95	
112	2.50	0.00	7.50	0.00	19.50	22.00	
113	7.00	0.00	13.50	0.00	22.00	23.00	
114	6.00	0.00	14.00	0.00	25.00	25.50	
115	6.00	0.00	15.00	0.00	28.00	29.90	
116	6.00	0.00	15.00	0.00	26.50	27.50	
117	6.00	0.00	17.00	0.00	25.50	27.00	
118	7.50	0.00	18.00	0.00	28.00	28.50	
119	9.00	0.00	18.00	0.00	27.00	28.53	
120	6.00	0.00	15.00	0.00	26.00	26.88	
121	6.00	0.00	19.00	0.00	27.70	27.90	
122	6.50	0.00	13.50	0.00	25.00	27.40	
123	7.50	0.00	17.50	0.00	29.00	30.00	
124	4.50	0.00	15.00	0.00	24.50	26.00	
125	5.50	0.00	16.00	0.00	26.00	27.00	
126	3.00	0.00	9.00	0.00	16.00	17.05	
127	8.00	0.00	18.00	0.00	31.00	32.10	
128	10.00	0.00	22.00	0.00	0.00	28.95	
129	3.00	0.00	11.00	0.00	27.50	27.50	
130	8.00	0.00	19.00	0.00	31.50	35.35	
131	9.00	0.00	23.00	0.00	35.00	36.00	
132	4.00	0.00	12.00	0.00	27.50	30.45	
133	8.00	0.00	20.00	0.00	35.00	35.00	
134	10.50	0.00	24.00	0.00	37.00	38.40	
135	6.00	0.00	12.00	0.00	29.50	31.60	

TABLE A4-4

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
136	11.50	0.00	20.50	0.00	34.50	37.45	
137	14.00	0.00	28.00	0.00	37.50	40.50	
138	3.00	0.00	11.00	0.00	29.00	31.40	
139	8.00	0.00	22.00	0.00	34.00	39.00	
140	11.00	0.00	22.00	0.00	36.00	[illegible]	
141	0.00	0.00	0.00	0.00	0.00	2.87	
142	0.00	0.00	0.00	0.00	0.00	2.53	
143	0.00	0.00	0.00	0.00	0.00	2.22	
144	0.00	0.00	0.00	0.00	0.00	1.82	
145	0.00	0.00	0.00	0.00	0.00	1.67	
146	0.00	0.00	0.00	0.00	0.00	3.39	
147	0.00	0.00	0.00	0.00	0.00	2.99	
148	0.00	0.00	0.00	0.00	0.00	2.51	
149	0.00	0.00	0.00	0.00	0.00	2.33	
150	0.00	0.00	0.00	0.00	0.00	1.61	
151	0.00	0.00	0.00	0.00	0.00	3.02	
152	0.00	0.00	0.00	0.00	0.00	2.10	
153	0.00	0.00	0.00	0.00	0.00	2.38	
154	0.00	0.00	0.00	0.00	0.00	3.35	
155	0.00	0.00	0.00	0.00	0.00	2.99	
156	0.00	0.00	0.00	0.00	0.00	2.25	
157	0.00	0.00	0.00	0.00	0.00	4.97	
158	0.00	0.00	0.00	0.00	0.00	4.20	
159	0.00	0.00	0.00	0.00	0.00	3.26	
160	0.00	0.00	0.00	0.00	0.00	2.94	
161	0.00	0.00	0.00	0.00	0.00	2.45	
162	0.00	0.00	0.00	0.00	0.00	2.78	
163	0.00	0.00	0.00	0.00	0.00	2.83	
164	0.00	0.00	0.00	0.00	0.00	3.16	
165	0.00	0.00	0.00	0.00	0.00	2.12	
166	0.00	0.00	0.00	0.00	0.00	2.82	
167	0.00	0.00	0.00	0.00	0.00	2.94	
168	0.00	0.00	0.00	0.00	0.00	2.74	
169	0.00	0.00	0.00	0.00	0.00	3.14	
170	0.00	0.00	0.00	0.00	0.00	3.36	
171	0.00	0.00	0.00	0.00	0.00	3.86	
172	0.00	0.00	0.00	0.00	0.00	4.34	
173	0.00	0.00	0.00	0.00	0.00	3.44	
174	0.00	0.00	0.00	0.00	0.00	3.28	
175	0.00	0.00	0.00	0.00	0.00	2.75	
176	0.00	0.00	0.00	0.00	0.00	3.04	
177	0.00	0.00	0.00	0.00	0.00	3.60	
178	35.00	0.00	50.00	0.00	0.00	88.00	
179	30.00	0.00	55.00	0.00	0.00	85.00	
180	30.00	0.00	35.00	0.00	0.00	75.00	

TABLE A4-5

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUNM)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
181	40.00	0.00	45.00	0.00	0.00	81.00	
182	45.00	0.00	65.00	0.00	0.00	76.00	
183	35.00	0.00	40.00	0.00	0.00	68.50	
184	35.00	0.00	40.00	0.00	0.00	70.00	
185	55.00	0.00	55.00	0.00	0.00	68.50	
186	35.00	0.00	55.00	0.00	0.00	65.00	
187	40.00	0.00	50.00	0.00	0.00	71.00	
188	45.00	0.00	55.00	0.00	0.00	72.50	
189	30.00	0.00	30.00	0.00	0.00	62.50	
190	0.00	0.00	45.00	0.00	0.00	55.00	
191	45.00	0.00	50.00	0.00	0.00	53.75	
192	35.00	0.00	40.00	0.00	0.00	45.00	
193	45.00	0.00	40.00	0.00	0.00	54.50	
194	35.00	0.00	50.00	0.00	0.00	55.00	
195	0.00	0.00	40.00	0.00	0.00	47.90	
196	15.00	25.00	38.50	0.00	37.40	38.50	
197	10.00	35.00	39.50	0.00	37.60	39.50	
198	15.00	35.00	40.00	0.00	39.00	40.00	
199	10.00	25.00	35.00	0.00	35.00	37.00	
200	12.50	25.00	37.50	0.00	35.00	37.50	
201	12.50	27.50	35.00	0.00	35.00	37.00	
202	12.50	25.00	38.50	0.00	37.50	38.50	
203	10.00	25.00	41.50	0.00	40.00	41.50	
204	10.50	25.00	40.50	0.00	37.80	40.50	
205	2.00	0.00	5.50	0.00	6.20	7.00	
206	4.75	0.00	8.55	0.00	9.05	9.60	
207	4.00	0.00	7.00	0.00	9.75	10.75	
208	7.50	0.00	12.00	0.00	13.50	13.80	
209	2.50	0.00	5.25	0.00	6.63	6.70	
210	4.75	0.00	8.35	0.00	8.65	9.25	
211	4.50	0.00	7.00	0.00	10.75	11.00	
212	8.00	0.00	12.00	0.00	13.00	13.95	
213	2.50	0.00	5.50	0.00	6.85	7.20	
214	3.50	0.00	7.00	0.00	7.65	8.45	
215	0.00	0.00	7.95	0.00	0.00	8.60	
216	8.50	0.00	8.50	0.00	0.00	9.15	
217	7.00	0.00	12.40	0.00	0.00	12.40	
218	6.00	0.00	11.50	0.00	0.00	12.30	
219	3.00	0.00	7.60	0.00	7.50	8.30	
220	3.50	0.00	7.60	0.00	7.50	8.00	
221	9.00	0.00	12.75	0.00	14.00	14.20	
222	9.00	0.00	11.70	0.00	14.00	14.05	
223	7.00	0.00	11.25	0.00	13.10	13.80	
224	7.00	0.00	11.50	0.00	13.20	13.85	
225	6.30	0.00	0.00	0.00	10.00	10.35	

TABLE A4-6

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
226	7.00	0.00	0.00	0.00	10.00	10.50	
227	8.00	0.00	0.00	0.00	11.60	12.00	
228	9.00	12.20	12.40	0.00	12.20	12.40	
229	0.00	0.00	0.00	0.00	0.00	4.16	
230	0.00	0.00	0.00	0.00	0.00	4.08	
231	0.00	0.00	0.00	0.00	0.00	5.20	
232	0.00	0.00	0.00	0.00	0.00	5.95	
233	0.00	0.00	0.00	0.00	0.00	6.88	
234	0.00	0.00	0.00	0.00	0.00	6.85	
235	0.00	0.00	0.00	0.00	12.00	12.40	
236	4.00	0.00	0.00	0.00	8.90	9.20	
237	14.00	0.00	18.00	0.00	0.00	18.00	
238	10.00	0.00	24.00	0.00	0.00	25.00	
239	1.75	0.00	0.00	0.00	0.00	4.00	
240	1.75	0.00	3.80	0.00	0.00	3.90	
241	1.50	0.00	3.60	0.00	0.00	3.80	
242	2.75	0.00	4.80	0.00	0.00	4.80	
243	2.75	0.00	4.60	0.00	0.00	4.60	
244	3.00	0.00	4.60	0.00	0.00	4.60	
245	2.50	0.00	0.00	0.00	0.00	4.40	
246	1.50	0.00	0.00	0.00	0.00	3.80	
247	2.25	0.00	0.00	0.00	0.00	4.50	
248	2.25	0.00	5.00	0.00	0.00	5.00	
249	2.50	0.00	5.40	0.00	0.00	5.80	
250	2.50	0.00	0.00	0.00	0.00	5.70	
251	1.25	0.00	4.00	0.00	0.00	4.10	
252	1.25	0.00	4.00	0.00	0.00	4.20	
253	1.20	0.00	3.50	0.00	0.00	4.50	
254	2.25	0.00	0.00	0.00	0.00	5.50	
255	3.00	0.00	0.00	0.00	0.00	6.00	
256	2.00	0.00	0.00	0.00	0.00	6.20	
257	1.50	0.00	4.00	0.00	0.00	4.50	
258	1.50	0.00	3.60	0.00	0.00	4.40	
259	2.75	0.00	4.00	0.00	0.00	4.00	
260	2.50	0.00	5.60	0.00	0.00	6.10	
261	3.00	0.00	5.60	0.00	0.00	6.70	
262	3.00	0.00	5.60	0.00	0.00	6.30	
263	0.00	0.00	0.00	0.00	0.00	3.50	
264	0.00	0.00	0.00	0.00	0.00	3.50	
265	0.00	0.00	0.00	0.00	0.00	4.10	
266	0.00	0.00	0.00	0.00	0.00	3.75	
267	0.00	0.00	0.00	0.00	0.00	3.50	
268	0.00	0.00	0.00	0.00	0.00	4.10	
269	0.00	0.00	0.00	0.00	0.00	4.10	
270	0.00	0.00	0.00	0.00	0.00	4.10	

TABLE A4-7

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUNM)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
271	0.00	0.00	0.00	0.00	0.00	3.75	
272	0.00	0.00	0.00	0.00	0.00	3.75	
273	0.00	0.00	0.00	0.00	0.00	4.70	
274	0.00	0.00	0.00	0.00	0.00	4.10	
275	0.00	0.00	0.00	0.00	0.00	4.00	
276	0.00	0.00	0.00	0.00	0.00	3.50	
277	0.00	0.00	0.00	0.00	0.00	4.50	
278	0.00	0.00	0.00	0.00	0.00	4.75	
279	0.00	0.00	7.41	0.00	0.00	11.30	
280	0.00	0.00	6.91	0.00	0.00	9.42	
281	0.00	0.00	6.09	0.00	0.00	8.67	
282	0.00	0.00	5.73	0.00	0.00	7.03	
283	0.00	0.00	0.00	0.00	0.00	12.20	
284	0.00	0.00	0.00	0.00	0.00	7.00	
285	0.00	0.00	0.00	0.00	0.00	4.79	
286	0.00	0.00	0.00	0.00	0.00	4.10	
287	0.00	0.00	0.00	0.00	0.00	2.09	
288	0.00	0.00	0.00	0.00	0.00	3.75	
289	0.00	0.00	0.00	0.00	0.00	14.40	
290	0.00	0.00	0.00	0.00	0.00	12.20	
291	0.00	0.00	0.00	0.00	0.00	14.50	
292	0.00	0.00	0.00	0.00	0.00	7.26	
293	0.00	0.00	0.00	0.00	0.00	12.70	
294	0.00	0.00	0.00	0.00	0.00	9.40	
295	0.00	0.00	0.00	0.00	0.00	9.50	
296	0.00	0.00	0.00	0.00	0.00	4.80	
297	0.00	0.00	0.00	0.00	0.00	9.10	
298	0.00	0.00	0.00	0.00	0.00	7.00	
299	0.00	0.00	0.00	0.00	0.00	7.10	
300	0.00	0.00	0.00	0.00	0.00	6.00	
301	0.00	0.00	0.00	0.00	0.00	6.60	
302	0.00	0.00	0.00	0.00	0.00	6.50	
303	0.00	0.00	0.00	0.00	0.00	3.80	
304	0.00	0.00	0.00	0.00	0.00	3.90	
305	0.00	9.50	0.00	0.00	0.00	10.85	
306	0.00	7.00	0.00	0.00	0.00	10.30	
307	0.00	7.00	0.00	0.00	0.00	8.30	
308	0.00	6.00	0.00	0.00	0.00	7.00	
309	0.00	7.50	0.00	0.00	0.00	10.00	
310	0.00	8.00	0.00	0.00	0.00	8.75	
311	0.00	7.50	0.00	0.00	0.00	8.50	
312	0.00	6.50	0.00	0.00	0.00	9.75	
313	0.00	0.00	0.00	0.00	0.00	6.90	
314	0.00	5.00	0.00	0.00	0.00	6.50	
315	0.00	10.00	0.00	0.00	0.00	12.60	

TABLE A4-8

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
316	0.00	10.75	0.00	0.00	0.00	11.00	
317	0.00	11.50	0.00	0.00	0.00	13.60	
318	0.00	8.50	0.00	0.00	0.00	10.30	
319	0.00	10.10	0.00	0.00	0.00	12.25	
320	0.00	7.50	0.00	0.00	0.00	8.90	
335	4.00	0.00	11.00	0.00	0.00	21.00	
336	4.00	0.00	14.00	0.00	0.00	23.00	
337	7.00	0.00	14.00	0.00	0.00	22.60	
338	0.00	0.00	0.00	0.00	0.00	26.00	
339	10.00	0.00	16.00	0.00	0.00	26.80	
340	6.00	0.00	14.00	0.00	0.00	29.00	
341	14.00	0.00	18.00	0.00	0.00	18.00	
342	6.00	0.00	18.00	0.00	0.00	25.00	
343	1.40	0.00	0.00	0.00	4.20	5.10	
344	1.40	0.00	3.90	0.00	4.25	4.75	
345	.90	0.00	3.40	0.00	4.45	4.65	
346	1.40	0.00	4.40	0.00	4.30	4.90	
347	.90	0.00	4.40	0.00	4.15	4.80	
348	.90	0.00	3.90	0.00	4.30	6.00	
349	.90	0.00	3.90	0.00	4.00	4.55	
350	.95	0.00	4.40	0.00	4.20	5.55	
351	3.40	0.00	6.40	0.00	8.70	9.60	
352	1.90	0.00	6.90	0.00	8.90	9.40	
353	2.40	0.00	8.50	0.00	8.50	10.60	
354	1.90	0.00	7.90	0.00	8.90	9.55	
355	.90	0.00	3.90	0.00	5.70	6.40	
356	1.40	0.00	3.90	0.00	5.50	6.90	
357	1.40	0.00	3.90	0.00	5.80	5.90	
358	1.40	0.00	3.40	0.00	5.90	6.10	
359	.90	0.00	3.90	0.00	5.75	6.60	
360	1.40	0.00	4.90	0.00	5.90	6.10	
361	1.40	0.00	3.40	0.00	5.95	6.00	
362	1.40	0.00	4.90	0.00	5.80	6.10	
363	1.90	0.00	5.40	0.00	5.75	6.00	
364	.90	0.00	5.40	0.00	5.90	6.45	
365	.90	0.00	3.90	0.00	5.70	7.60	
366	2.40	0.00	9.40	0.00	10.40	11.80	
367	2.90	0.00	0.00	0.00	9.90	10.60	
368	2.90	0.00	6.40	0.00	9.90	10.20	
369	2.90	0.00	5.60	0.00	8.50	9.75	
372	3.00	5.50	6.00	0.00	7.50	7.60	
373	3.00	6.00	7.00	0.00	9.00	9.00	
374	3.00	6.00	7.00	0.00	0.00	11.15	
375	2.50	6.00	7.00	0.00	0.00	12.25	
376	3.00	6.00	6.00	0.00	9.00	9.50	

TABLE A4-9

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
377	3.00	5.50	5.50	0.00	9.00	9.05	
378	4.00	6.00	6.50	0.00	8.25	8.45	
379	3.00	5.00	6.50	0.00	8.40	8.40	
380	3.50	5.00	6.50	0.00	8.05	8.55	
381	0.00	0.00	0.00	0.00	8.00	8.00	
382	0.00	0.00	0.00	0.00	9.30	9.55	
383	4.50	8.00	9.50	0.00	11.50	11.60	
384	5.50	8.00	9.00	0.00	11.50	11.60	
385	5.00	8.50	9.00	0.00	11.80	11.80	
386	4.50	8.00	8.50	0.00	11.50	11.80	
387	4.50	9.00	9.00	0.00	12.50	12.70	
388	2.50	5.50	5.50	0.00	0.00	11.30	
389	4.00	11.50	4.50	0.00	0.00	12.80	
390	2.00	8.50	5.50	0.00	0.00	14.35	
391	2.50	7.50	5.50	0.00	0.00	14.45	
392	1.00	3.50	4.00	0.00	0.00	6.75	
393	1.50	5.50	4.00	0.00	0.00	5.50	
394	2.00	4.50	4.50	0.00	0.00	7.25	
395	1.50	4.00	3.50	0.00	0.00	8.20	
396	2.50	4.50	5.00	0.00	0.00	9.95	
397	2.50	5.00	5.00	0.00	0.00	12.20	
398	1.50	3.50	4.00	0.00	0.00	5.95	
399	1.50	4.00	3.50	0.00	0.00	7.75	
400	2.00	4.50	4.50	0.00	0.00	10.10	
410	2.00	6.00	4.00	0.00	0.00	10.50	
402	1.00	3.50	3.50	0.00	0.00	6.60	
403	2.00	5.00	5.00	0.00	0.00	7.80	
404	2.00	4.00	4.50	0.00	0.00	10.50	
405	1.50	5.00	4.00	0.00	0.00	11.65	
406	2.00	4.50	5.50	0.00	0.00	12.20	
407	5.00	11.00	10.00	0.00	0.00	14.95	
408	6.00	10.00	10.00	0.00	0.00	15.70	
409	6.00	11.50	9.50	0.00	0.00	17.10	
410	4.00	14.50	9.00	0.00	0.00	17.20	
411	3.00	6.00	7.00	0.00	0.00	7.85	
412	3.50	6.20	6.20	0.00	0.00	7.10	
413	4.00	6.00	7.00	0.00	0.00	8.80	
414	4.00	6.50	7.00	0.00	0.00	9.65	
415	4.00	6.00	7.00	0.00	0.00	7.10	
416	3.50	6.00	6.50	0.00	0.00	8.85	
417	3.00	6.50	6.50	0.00	0.00	9.70	
418	3.50	6.50	6.50	0.00	0.00	7.10	
419	3.50	7.00	7.00	0.00	0.00	9.95	
420	3.50	6.50	6.00	0.00	0.00	11.45	
421	4.50	6.50	6.50	0.00	0.00	12.10	

TABLE A4-10

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
422	2.00	4.50	5.50	0.00	0.00	8.25	
423	3.50	5.50	7.10	0.00	0.00	9.25	
424	3.50	8.00	6.50	0.00	0.00	12.10	
425	4.00	7.00	7.50	0.00	0.00	14.65	
426	3.50	7.50	8.00	0.00	0.00	14.70	
427	8.50	0.00	12.50	0.00	0.00	17.40	
428	10.00	0.00	13.00	0.00	0.00	17.95	
429	2.50	8.00	7.00	0.00	0.00	19.05	
430	1.50	4.00	7.00	0.00	0.00	20.20	
431	5.00	0.00	0.00	0.00	0.00	9.30	
432	5.50	8.15	6.00	0.00	0.00	8.15	
433	4.50	9.50	10.00	0.00	0.00	11.40	
434	5.50	8.00	9.50	0.00	0.00	11.70	
435	5.00	8.50	8.90	0.00	0.00	9.00	
436	5.00	8.00	10.00	0.00	0.00	10.05	
437	5.00	6.00	9.00	0.00	0.00	11.25	
438	5.00	0.00	8.05	0.00	0.00	8.15	
439	5.00	0.00	8.50	0.00	0.00	11.70	
440	4.50	9.00	8.50	0.00	0.00	13.30	
441	5.00	8.50	8.50	0.00	0.00	14.15	
442	4.00	7.00	7.50	0.00	0.00	9.05	
443	4.50	0.00	9.50	0.00	0.00	10.80	
444	5.50	10.00	10.00	0.00	0.00	14.20	
445	5.50	8.50	8.50	0.00	0.00	15.20	
446	4.50	9.50	9.50	0.00	0.00	17.40	
447	5.00	7.50	7.75	0.00	7.85	8.25	
448	5.50	8.00	7.75	0.00	8.05	8.55	
449	5.00	7.50	8.00	0.00	8.05	9.50	
450	4.50	8.25	8.00	0.00	8.40	9.25	
451	5.50	8.00	8.50	0.00	10.55	11.50	
452	4.50	8.00	8.50	0.00	10.10	11.25	
453	5.00	8.00	8.50	0.00	11.25	12.75	
454	4.00	8.00	9.95	0.00	11.05	11.25	
455	5.00	7.00	11.00	15.00	17.80	18.10	BB
456	6.00	8.00	12.00	12.00	19.00	19.30	BB
457	8.00	10.00	10.00	16.00	18.30	18.40	BB
458	4.00	10.00	10.00	12.00	18.00	18.30	BB
459	4.00	8.00	12.00	12.00	16.60	17.60	BB
460	4.00	10.00	10.00	14.00	16.50	16.50	BB
461	6.00	9.00	10.00	16.00	16.50	17.00	BB
462	4.00	8.00	10.00	13.00	15.50	16.00	BB
463	3.00	7.00	6.00	6.00	9.10	9.80	BB
464	3.00	7.00	7.00	7.10	6.40	11.10	BB
465	4.00	7.00	8.00	8.00	10.10	11.00	BB
466	3.00	6.00	7.00	8.00	9.80	10.00	BB

TABLE A4-11

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUNM)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
467	2.00	5.00	6.00	5.00	9.00	10.10	BB
468	3.00	6.00	5.00	8.00	9.00	9.10	BB
469	2.00	6.00	7.00	7.00	8.50	9.10	BB
470	3.00	8.00	8.00	8.00	8.90	9.10	BB
471	6.00	8.00	9.80	12.00	11.30	13.00	FCBU
472	0.00	0.00	10.50	11.60	10.50	13.60	FCBU
473	6.00	6.00	0.00	8.00	8.40	9.80	FCBU
474	4.00	5.00	7.00	7.00	9.40	10.60	FCBU
476	4.00	8.00	9.10	8.80	9.00	9.20	FCBU
478	4.00	6.00	10.00	10.70	10.00	10.70	FCBU
479	2.00	3.50	5.20	5.20	5.25	5.50	FCBU
480	1.50	4.00	3.00	4.00	4.70	5.10	FCBU
481	1.50	3.50	4.00	4.00	5.00	5.20	FCBU
482	2.00	4.00	4.50	4.50	5.10	5.20	FCBU
483	1.50	4.80	0.00	5.10	4.80	5.10	FCBU
484	2.50	4.00	3.00	5.50	5.10	5.50	FCBU
485	1.50	4.30	4.90	4.30	4.70	5.00	FCBU
486	2.50	5.20	4.00	3.50	5.20	5.40	FCBU
487	5.00	7.00	10.00	10.00	9.50	11.30	FST
488	4.00	5.00	7.00	8.60	0.00	9.00	FST
489	6.00	9.00	9.00	9.00	10.60	14.30	FCBU
490	4.00	9.80	11.40	11.70	11.10	12.50	FCBU
491	4.00	9.00	11.70	0.00	10.70	11.50	FCBU
492	4.00	7.00	12.00	0.00	10.30	12.00	FCBU
493	9.00	16.00	14.00	17.50	17.50	17.50	FSC
494	4.00	5.30	7.00	0.00	8.00	8.80	FSCBU
495	4.00	7.00	9.00	9.30	9.30	9.30	FSCBU
496	6.00	11.00	10.00	14.00	13.00	14.35	FLSC
497	6.00	0.00	11.40	0.00	13.90	14.30	FST
498	3.50	4.25	6.10	0.00	6.10	6.75	FCBU
499	3.00	5.50	6.00	5.75	6.25	6.80	FCBU
500	5.00	0.00	12.00	15.95	17.00	17.85	FSC
501	5.00	10.00	12.00	16.00	16.00	16.00	SDT
502	4.00	6.00	7.50	9.00	9.65	9.80	FB
503	3.50	5.50	8.00	9.35	9.75	9.75	FB
504	4.50	6.75	9.25	12.50	13.00	13.60	FBBU
505	4.00	8.00	9.25	12.00	14.00	14.00	FBBU
506	3.00	5.00	7.75	10.00	11.60	12.40	FB
507	3.00	6.00	6.00	10.00	12.00	12.75	FB
508	6.00	0.00	12.00	0.00	13.00	13.00	SDT
509	7.00	9.10	10.50	9.10	9.10	9.80	FLSCBU
510	5.60	8.40	9.20	7.00	9.20	9.80	FLSCBU
511	8.50	11.00	11.00	0.00	13.60	14.40	FLSCBU
512	8.50	0.00	13.00	0.00	15.00	15.00	FSTBU
513	2.80	6.20	6.20	0.00	5.90	7.10	FLSCBU

TABLE A4-12

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
514	2.80	6.20	7.10	0.00	6.30	7.30	FLST
515	6.00	0.00	15.00	0.00	19.50	19.50	FSCBU
516	7.00	0.00	12.00	0.00	18.80	20.00	FSTBU
517	2.80	5.60	7.00	7.60	8.40	9.90	FLSCBU
518	2.80	5.60	8.40	9.20	9.10	9.20	FLSCBU
519	2.00	11.00	13.20	13.40	13.20	14.60	FB
520	5.60	8.40	12.70	13.80	13.80	13.80	FB
521	2.40	6.60	8.70	10.80	8.30	12.10	FLB(LSC)
522	4.00	6.00	11.50	10.30	11.50	12.10	FB
523	29.80	70.00	80.30	82.00	80.00	82.00	FSCBU
524	10.00	33.70	41.70	0.00	41.70	44.00	FCBU
525	12.50	30.00	0.00	0.00	39.70	39.70	FCBU
526	25.00	40.00	51.20	51.20	56.70	58.50	FLSCBU
527	20.00	50.00	52.50	0.00	60.70	63.30	FSTBU
528	10.00	16.80	26.30	0.00	26.30	28.10	FLSC
529	10.00	16.80	25.20	0.00	25.20	27.20	FST
530	20.00	40.00	45.30	58.00	69.30	69.30	FB
531	10.00	25.15	22.30	31.20	32.20	34.00	FB
532	10.00	22.60	30.00	0.00	34.70	35.80	FSC
533	10.00	27.50	27.50	0.00	35.80	35.80	FSC
534	10.00	20.60	27.50	0.00	34.30	36.30	FSC
535	15.00	50.00	40.00	50.20	60.30	60.30	FB(SC)
536	7.50	30.00	45.80	48.70	53.00	53.00	FB(S)
537	17.50	27.50	42.50	50.70	51.70	51.70	FB(S)
538	6.00	16.00	19.00	0.00	21.00	23.50	FLSTBU
539	5.00	10.00	0.00	0.00	10.00	11.50	FSCBU
540	5.00	11.00	10.50	0.00	11.50	12.10	FSCBU
541	6.00	12.00	14.30	13.10	15.00	16.80	FLST
542	5.00	14.00	15.90	0.00	15.00	15.90	FLSTW
543	4.60	7.00	8.20	7.00	7.50	9.00	FLST
544	5.00	12.50	17.10	0.00	18.00	21.20	FLST
545	4.00	12.00	14.00	17.00	18.00	22.00	FLST(B)
546	3.00	7.50	10.50	10.50	10.00	11.00	FLSTW
547	5.00	6.50	9.00	0.00	9.60	11.10	FST
548	6.00	10.00	12.00	13.40	14.00	16.80	FC
549	6.00	10.00	11.00	14.60	15.50	17.00	FLB
550	3.00	8.00	0.00	13.00	12.50	13.40	FLB
551	3.00	7.00	10.50	12.50	12.50	13.20	FB
552	6.00	0.00	20.00	0.00	20.25	20.50	FSBU
553	3.00	0.00	14.25	0.00	13.50	14.40	FLS
554	6.00	10.50	0.00	0.00	12.00	13.25	FCBU
555	7.00	10.50	0.00	0.00	12.00	12.75	FCBU
556	5.50	9.70	0.00	0.00	9.70	10.10	FCBU
557	5.00	9.25	0.00	0.00	10.00	10.40	FCBU
558	8.00	17.00	17.00	22.00	22.50	24.40	FSO

TABLE A4-13

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUNM)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
559	4.00	17.65	0.00	0.00	17.65	19.25	FS
560	5.00	9.00	0.00	0.00	13.30	14.90	FC
561	6.00	9.00	0.00	0.00	11.80	13.05	FC
562	5.00	9.00	11.00	11.05	12.15	13.10	FLB
563	4.00	8.00	8.50	0.00	9.50	10.15	FC
564	3.00	6.50	8.50	0.00	9.63	10.10	FLSTBU
565	5.00	9.50	13.00	14.35	15.00	15.00	FB
566	3.00	7.00	9.00	10.10	11.10	12.10	FB
594	4.00	7.20	6.00	11.00	12.00	12.00	FB
595	5.00	8.20	8.20	9.00	10.90	11.10	FBBU
596	4.00	6.00	6.00	6.00	13.30	13.30	FB
597	4.00	8.00	8.00	15.20	16.30	17.30	FB
598	3.00	9.00	6.00	16.20	16.30	16.30	BB(S)
599	1.00	5.00	5.00	5.50	8.40	8.80	FB
600	4.00	7.00	8.00	8.00	13.00	13.00	BB
601	5.00	8.00	9.00	11.00	12.50	12.50	BB
602	2.00	7.00	5.00	13.00	14.50	18.00	BB
603	2.00	8.00	8.00	8.00	15.20	15.20	S(B)
604	1.00	5.00	6.00	6.00	8.50	8.50	BB
605	3.00	8.50	6.00	12.00	22.20	22.20	BB
606	2.00	5.00	5.00	6.00	10.20	11.50	FB
607	1.00	5.00	4.10	7.90	11.10	11.10	BB
608	4.00	12.40	8.40	9.00	15.00	16.00	BB
609	4.95	7.55	8.50	13.30	13.18	13.54	FSLBM
610	4.80	7.80	8.50	13.42	12.72	13.42	FB
611	2.60	6.90	6.96	11.80	10.92	11.80	FLB
612	3.75	6.92	8.00	9.56	11.04	11.97	FLB
613	5.80	8.60	9.00	0.00	10.35	10.69	FCBU
614	4.90	8.80	9.00	0.00	10.70	10.90	FSCBUO
615	3.70	6.30	7.71	0.00	8.00	8.79	FST
616	3.70	7.50	8.00	0.00	8.36	8.40	FSTW
617	2.50	5.90	7.40	0.00	7.92	8.17	FSCBU
618	2.45	5.00	7.91	5.30	7.91	8.36	FSCBUO
619	2.90	5.40	5.20	0.00	7.15	7.37	FSCBUO
620	2.60	4.65	4.00	5.20	7.18	7.45	FLB
621	3.70	4.00	5.90	0.00	6.19	6.28	FCBU
622	2.45	5.00	6.00	0.00	6.20	6.67	FCBUO
623	1.75	3.80	5.00	0.00	5.26	5.49	FSCBU
624	2.80	5.00	4.85	0.00	5.40	5.40	FCBU
625	2.60	8.00	8.00	13.44	14.70	15.22	FB
626	9.10	16.90	16.90	0.00	16.90	17.60	FSCBU
627	6.00	14.10	13.00	0.00	16.90	18.70	FSCC
628	8.10	17.40	16.00	0.00	17.40	17.80	FSCC
629	4.00	8.10	9.00	4.70	9.10	10.50	FCBU
630	3.00	8.10	9.10	9.20	9.10	10.20	FLSCBU

TABLE A4-14

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
631	3.00	8.00	9.30	0.00	9.30	10.40	FCBU
632	5.10	11.00	12.20	16.00	16.60	16.90	FST
633	5.10	8.10	10.00	0.00	16.70	18.60	FSC
634	5.10	11.00	12.10	0.00	15.60	18.30	FSCC
635	3.00	7.00	8.00	9.40	8.90	10.70	FLSTWBU
636	2.20	7.00	8.20	10.10	8.50	10.70	FLSTWBU
637	2.00	6.00	8.20	0.00	8.20	10.40	FLSCW
638	4.00	9.00	10.00	11.00	13.80	15.00	FB
639	4.00	9.00	10.00	13.90	14.80	16.20	FLSC
640	5.00	8.00	10.00	11.50	13.60	15.00	FC
641	2.80	5.00	0.00	0.00	7.35	7.35	FCBU
642	4.00	5.00	0.00	0.00	6.85	7.60	FCBU
643	4.30	6.00	0.00	0.00	7.40	7.40	FCBU
645	8.00	14.00	17.00	19.00	22.90	27.30	FSTBC
646	12.00	18.00	22.60	23.70	22.60	25.70	FSTBC
647	8.00	16.00	19.00	24.00	21.80	24.90	FSTBC
648	8.00	12.00	19.00	19.00	21.00	23.60	FSTBC
649	9.00	21.00	23.50	23.30	23.70	27.20	FBSTC
650	10.00	19.00	22.40	23.00	22.40	25.70	FSTBC
651	8.00	16.00	19.60	20.80	21.80	25.90	FSTBC
652	6.00	15.00	19.00	19.80	22.50	26.50	FSTBC
653	8.00	17.00	21.00	21.00	23.70	26.00	FBSTC
654	9.00	16.00	19.00	23.00	24.30	26.40	FSTBC
655	9.00	19.00	17.00	19.00	24.50	26.20	FSTBC
656	8.00	16.00	21.00	22.60	22.60	24.80	FBSTC
657	12.00	16.00	21.50	21.50	21.50	25.80	FBSTC
658	10.00	16.00	17.00	21.00	25.00	26.20	FSTBC
659	10.00	22.50	26.60	26.00	26.60	26.60	FBSTC
660	3.30	6.40	7.50	7.00	9.20	9.90	FLDT(B)
661	3.20	6.00	7.50	7.90	9.00	9.80	FLDTSCBO
662	2.50	5.20	5.80	5.80	7.50	7.60	FDTBOBU
663	2.40	4.90	6.00	6.00	7.40	7.80	FLDT
664	3.70	7.00	7.50	7.50	9.60	9.70	FBODT
665	4.00	7.00	7.50	7.50	9.50	9.50	FBODTBU
666	2.00	4.50	5.50	5.50	6.00	6.30	FSCBU
667	1.80	4.50	5.30	5.30	5.90	6.20	FLSCBU
668	3.00	5.80	7.50	8.00	8.30	8.30	FSCDTBU
669	3.50	5.70	7.50	7.50	8.00	8.30	FLSCBU
670	2.00	5.00	5.80	5.80	7.80	8.40	FBO(DT)
671	2.30	5.00	5.80	5.80	8.10	8.60	FDT
672	2.50	6.00	5.50	7.40	8.20	8.50	F(B)C
673	3.00	4.50	5.50	6.70	0.00	8.60	BB
674	2.50	5.50	6.00	11.20	10.20	11.20	FB(C)
675	3.00	8.50	5.00	9.30	11.80	12.60	SBCFC
676	4.00	5.50	9.00	9.50	0.00	13.70	BB

TABLE A4-15

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUNM)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
677	3.50	5.00	6.50	7.50	0.00	13.70	BCB
678	2.00	4.50	0.00	4.00	6.50	6.80	FCB
679	3.00	6.00	5.00	6.90	7.30	7.30	FBC
680	3.00	5.80	7.30	7.10	8.00	8.30	FB
681	2.70	6.20	6.20	6.90	9.30	9.40	FCB
682	3.00	4.00	6.50	6.50	8.30	8.80	BFC
683	2.50	4.00	0.00	8.30	0.00	8.80	BB
684	3.00	5.00	6.50	8.00	10.40	11.20	BCB
685	6.50	11.50	9.00	12.93	13.00	13.53	FST
686	6.30	12.00	15.00	17.00	17.30	19.00	FLSB
687	7.00	12.00	14.30	12.70	18.00	18.00	FSB
688	6.00	12.00	12.00	12.00	19.70	23.40	FLSB
689	9.00	16.00	19.30	17.00	17.00	19.30	FLS
690	7.70	15.00	20.70	19.60	21.60	23.30	FLSBBU
691	12.70	20.00	22.50	0.00	22.50	23.40	FSBU
692	12.00	21.00	18.00	25.30	25.30	26.80	FSBBU
693	3.70	8.30	0.00	0.00	8.30	9.40	F
694	3.30	8.00	0.00	11.00	11.70	16.00	FLS(B)
695	3.20	7.00	10.00	10.00	11.70	12.70	BS
696	4.00	8.00	10.00	14.30	14.30	15.50	FLSB
697	5.00	10.50	0.00	0.00	12.10	12.50	FBU
698	6.00	10.00	0.00	13.00	15.60	16.60	FLSBU
699	8.00	13.00	12.50	13.00	14.80	15.00	FBU
700	8.00	12.50	0.00	14.00	17.70	18.80	FBU
701	3.00	6.00	8.70	8.70	8.70	11.40	FLS
702	3.00	6.00	8.60	8.30	8.60	10.90	FS
703	3.20	6.00	8.00	8.00	10.20	11.70	FLS
704	3.30	6.00	8.30	8.00	8.30	10.90	F
705	3.30	6.00	7.50	7.30	8.50	11.40	FLS
706	4.00	8.00	0.00	0.00	8.50	9.00	FBU
707	4.00	8.60	0.00	9.50	10.60	11.60	F
708	3.33	8.00	0.00	9.00	10.33	12.80	F
709	4.17	8.00	11.00	9.00	11.50	12.33	F
710	5.50	10.00	0.00	10.50	10.33	11.00	FBU
711	5.00	9.00	0.00	11.00	13.63	14.10	F
712	0.00	0.00	0.00	0.00	10.50	10.70	FCBU
713	0.00	0.00	0.00	0.00	10.25	10.35	FCBU
714	0.00	0.00	0.00	0.00	10.35	10.50	FLSCBU
715	0.00	0.00	0.00	0.00	9.55	9.90	FLSCBU
716	0.00	0.00	0.00	0.00	9.70	9.90	FSTW
717	0.00	0.00	0.00	0.00	14.10	14.10	FBO
718	0.00	0.00	0.00	0.00	12.05	13.00	FBO
719	0.00	0.00	0.00	0.00	12.00	12.50	F(C)BO
720	0.00	0.00	0.00	0.00	12.25	12.50	FBO
721	0.00	0.00	0.00	0.00	12.25	12.70	FBO

TABLE A4-16

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
722	0.00	0.00	0.00	0.00	13.30	14.25	FDT
723	0.00	0.00	0.00	0.00	13.40	13.85	FDT
724	0.00	0.00	0.00	0.00	14.00	14.50	FDT
725	0.00	0.00	0.00	0.00	12.90	13.45	FDT
726	0.00	0.00	0.00	0.00	13.00	13.65	FDT
727	0.00	0.00	0.00	0.00	13.30	14.15	FDT
728	0.00	0.00	0.00	0.00	9.75	10.40	FC(B)BU
729	0.00	0.00	0.00	0.00	5.50	5.85	FC(B)
730	0.00	0.00	0.00	0.00	11.60	12.70	FCDT
731	0.00	0.00	0.00	0.00	6.75	7.85	FC(B)
732	0.00	0.00	0.00	0.00	11.00	11.20	FC(B)
733	0.00	0.00	0.00	0.00	8.40	9.65	FC(B)
734	0.00	0.00	0.00	0.00	11.55	12.90	FCLSC
735	0.00	0.00	0.00	0.00	14.75	15.00	FCLSC
736	0.00	0.00	0.00	0.00	11.85	12.70	FC
737	0.00	0.00	0.00	0.00	14.50	15.25	FCLSC
738	0.00	0.00	0.00	0.00	14.25	15.65	FCB
739	0.00	0.00	0.00	0.00	15.50	15.50	FB
740	0.00	0.00	0.00	0.00	14.20	16.15	FCLSC
741	0.00	0.00	0.00	0.00	16.95	17.40	FCB
742	0.00	0.00	0.00	0.00	10.50	11.30	FCLSC
743	0.00	0.00	0.00	0.00	12.75	13.35	FCB
744	0.00	0.00	0.00	0.00	9.90	11.00	FCBU
745	0.00	0.00	0.00	0.00	12.95	13.80	FCLSC
746	0.00	0.00	0.00	0.00	10.25	11.30	FCBU
747	0.00	0.00	0.00	0.00	12.85	13.70	FCB
748	0.00	0.00	0.00	0.00	10.35	11.35	FCBU
749	0.00	0.00	0.00	0.00	12.90	13.15	FCBU
750	0.00	0.00	0.00	0.00	9.20	10.05	FCBU
751	0.00	0.00	0.00	0.00	7.37	7.77	FLSCBU
752	0.00	0.00	0.00	0.00	9.20	9.63	FC(BU)
753	0.00	0.00	0.00	0.00	6.05	6.48	FCBU
754	0.00	0.00	0.00	0.00	7.70	8.00	FCBU
755	0.00	0.00	0.00	0.00	7.90	8.45	FC(T)
756	0.00	0.00	0.00	0.00	10.00	10.85	FLSCBU
757	0.00	0.00	0.00	0.00	10.19	11.05	FLSCBU
758	0.00	0.00	0.00	0.00	6.34	6.70	FCBU
759	0.00	0.00	0.00	0.00	6.20	6.54	FCBU
760	0.00	0.00	0.00	0.00	6.67	7.27	FLSCBU
761	0.00	0.00	0.00	0.00	6.65	7.10	FSCBU
762	0.00	0.00	0.00	0.00	8.08	8.48	FLSCBU
763	0.00	0.00	0.00	0.00	8.05	8.50	FLSCBU
764	0.00	0.00	0.00	0.00	9.20	9.82	FLSCBU
765	0.00	0.00	0.00	0.00	9.43	9.70	FLSCBU
766	0.00	0.00	0.00	0.00	8.45	8.72	FLSC(BO)

TABLE A4-17

RESULTS OF SPECIMENS TESTED IN JAPAN
(SEE END OF TABLE FOR IDENTIFICATION OF COLUNM)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
767	0.00	0.00	0.00	0.00	8.30	8.72	FSCBU
768	0.00	0.00	0.00	0.00	8.22	8.72	FLSCBU
769	0.00	0.00	0.00	0.00	8.30	8.75	FLSCBU
770	0.00	0.00	0.00	0.00	9.45	9.95	FLSCBU
771	0.00	0.00	0.00	0.00	9.57	9.93	FLSCBU
772	0.00	0.00	0.00	0.00	6.60	7.07	FLSCBU
773	0.00	0.00	0.00	0.00	6.68	6.99	FLSCBU
774	0.00	0.00	0.00	0.00	12.05	12.30	FCBU
775	0.00	0.00	0.00	0.00	12.40	14.45	FCBU
776	0.00	0.00	0.00	0.00	11.45	14.65	FCBU
777	0.00	0.00	0.00	0.00	15.15	15.50	FCBU
778	0.00	0.00	0.00	0.00	15.25	15.95	FCBU
779	0.00	0.00	0.00	0.00	14.95	16.60	FCBU
780	0.00	0.00	0.00	0.00	15.00	16.75	FCBU
781	0.00	0.00	0.00	0.00	43.00	46.00	FCBU
782	0.00	0.00	0.00	0.00	37.90	38.80	FCSCBU
783	0.00	0.00	0.00	0.00	40.00	41.50	FCLB
784	0.00	0.00	0.00	0.00	44.00	45.20	FCBSCBU
785	0.00	0.00	0.00	0.00	43.10	44.10	FCSCBU
786	0.00	0.00	0.00	0.00	8.75	9.80	FC
787	0.00	0.00	0.00	0.00	12.60	14.30	FC(B)
788	0.00	0.00	0.00	0.00	16.00	16.00	FC(B)*
789	0.00	0.00	0.00	0.00	0.00	6.95	FC
790	0.00	0.00	0.00	0.00	9.60	10.05	FC
791	0.00	0.00	0.00	0.00	12.60	12.75	FCSC(B)*

LEGEND FOR TABLE A5

(1) mark

(2) yield load (zero value indicates no value reported), tons

(3) maximum load, tons

(4) flexural capacity calculated by Eq. 2.1.8

(5) flexural capacity calculated by Eq. 2.25-30

(6) shear capacity calculated by Eq. 2.13

(7) shear capacity calculated by Eq. 2.17

(8) (3)/(4)

(9) (3)/(5)

(10) (3)/(6)

(11) (3)/(7)

TABLE A5 - 1
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	0.00	6.30	12.81	13.69	1.68	6.21	.492	.460	3.755	1.015
2	0.00	4.03	6.35	6.81	1.37	3.39	.635	.592	2.946	1.189
3	0.00	1.85	3.11	3.29	1.31	1.94	.595	.562	1.417	.953
4	0.00	1.60	2.10	2.23	1.25	1.32	.762	.716	1.278	1.210
5	0.00	8.60	20.49	23.86	3.49	7.76	.420	.360	2.461	1.109
6	0.00	6.70	9.80	11.32	2.46	4.98	.684	.592	2.727	1.346
7	0.00	4.30	5.06	5.91	1.73	3.45	.850	.727	2.481	1.247
8	0.00	3.30	3.44	4.03	1.52	2.88	.959	.818	2.170	1.145
9	0.00	6.40	12.89	13.66	2.63	7.56	.497	.469	2.433	.846
10	0.00	4.85	6.39	6.78	2.30	4.55	.759	.715	2.108	1.067
11	0.00	3.00	3.30	3.52	2.17	2.80	.909	.853	1.385	1.071
12	0.00	1.90	2.03	2.14	2.18	2.27	.936	.889	.870	.837
13	0.00	7.90	21.54	29.41	4.02	8.99	.367	.269	1.966	.879
14	0.00	6.00	10.71	14.63	3.05	6.13	.560	.410	1.968	.979
15	0.00	4.20	5.56	7.31	2.46	4.43	.755	.575	1.709	.947
16	0.00	3.00	3.45	4.05	2.29	3.70	.870	.740	1.310	.811
17	0.00	7.00	13.16	13.76	1.85	7.48	.532	.509	3.784	.936
18	0.00	3.45	6.38	6.70	1.54	4.07	.541	.515	2.241	.848
19	0.00	2.00	3.14	3.28	1.44	2.24	.637	.610	1.393	.892
20	0.00	1.85	2.21	2.34	1.35	1.46	.837	.792	1.370	1.264
21	0.00	2.67	3.17	3.31	2.20	3.02	.842	.807	1.211	.883
22	0.00	2.72	3.23	3.38	2.19	3.01	.842	.804	1.241	.903
23	0.00	4.95	5.65	6.76	3.09	4.99	.876	.732	1.602	.992
24	0.00	4.45	5.58	6.64	3.17	4.96	.797	.670	1.402	.897
25	0.00	5.05	5.62	7.87	3.46	5.10	.899	.641	1.461	.990
26	0.00	5.00	5.72	7.86	3.43	5.14	.874	.636	1.457	.973
27	0.00	4.02	4.54	4.93	2.48	6.03	.885	.816	1.621	.667
28	0.00	4.60	4.82	5.31	2.44	6.08	.954	.867	1.886	.757
29	1.90	2.02	2.13	2.25	2.09	2.24	.948	.899	.968	.903
30	0.00	2.00	2.18	2.30	2.85	2.57	.917	.869	.702	.778
31	2.00	2.05	2.28	2.41	2.87	2.59	.899	.850	.713	.792
32	0.00	2.00	2.16	2.28	2.84	2.58	.926	.878	.704	.774
33	0.00	1.97	2.17	2.29	2.84	2.57	.908	.861	.693	.766
34	0.00	2.00	2.22	2.33	2.89	2.61	.901	.857	.692	.767
35	0.00	3.25	3.77	5.25	2.48	4.11	.862	.619	1.310	.791
36	0.00	3.22	3.76	5.25	2.48	4.10	.856	.613	1.301	.786
37	0.00	3.40	3.95	5.25	2.47	4.19	.861	.647	1.375	.812
38	0.00	3.72	3.65	4.85	3.06	4.11	1.019	.767	1.214	.905
39	3.22	3.47	3.63	4.85	3.00	4.07	.956	.716	1.158	.852
40	0.00	3.40	3.69	4.85	3.00	4.09	.921	.702	1.134	.831
41	5.30	5.70	5.16	5.39	8.23	6.25	1.105	1.058	.693	.911
42	5.10	5.65	5.16	5.39	8.23	6.25	1.095	1.049	.687	.903
43	6.10	7.55	6.26	6.67	8.28	6.89	1.206	1.132	.912	1.095
44	6.50	7.80	6.26	6.67	8.28	6.89	1.246	1.170	.942	1.131
45	7.50	8.40	7.22	7.95	8.33	7.53	1.163	1.057	1.008	1.115

TABLE A5 - 2

TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
46	8.00	8.20	7.22	7.95	8.33	7.53	1.136	1.032	.984	1.088
47	8.25	8.85	7.97	9.23	8.41	8.17	1.110	.959	1.053	1.083
48	8.00	8.25	7.97	9.23	8.41	8.17	1.035	.894	.981	1.009
49	5.40	5.80	5.16	5.39	13.26	7.57	1.124	1.077	.437	.766
50	5.30	6.00	5.16	5.39	13.26	7.57	1.163	1.114	.452	.792
51	6.50	7.50	6.26	6.67	13.32	8.21	1.198	1.125	.563	.913
52	6.30	7.00	6.26	6.67	13.32	8.21	1.118	1.050	.526	.852
53	8.30	8.50	7.22	7.95	13.37	8.85	1.177	1.070	.636	.960
54	8.00	8.80	7.22	7.95	13.37	8.85	1.219	1.107	.658	.994
55	9.00	9.60	7.97	9.23	13.44	9.49	1.205	1.040	.714	1.011
56	9.00	9.40	7.97	9.23	13.44	9.49	1.179	1.019	.699	.990
57	9.50	10.35	8.04	10.51	13.60	10.13	1.287	.985	.761	1.021
58	9.00	10.20	8.04	10.51	13.60	10.13	1.269	.971	.750	1.007
59	4.20	4.65	3.94	4.04	7.36	5.94	1.180	1.150	.632	.783
60	4.35	4.40	3.94	4.04	7.36	5.94	1.117	1.088	.598	.741
61	5.60	5.85	5.08	5.32	7.42	6.58	1.152	1.099	.788	.890
62	5.60	5.90	5.08	5.32	7.42	6.58	1.161	1.108	.795	.897
63	6.50	7.00	6.11	6.60	7.49	7.22	1.146	1.060	.934	.970
64	6.50	7.00	6.11	6.60	7.49	7.22	1.146	1.060	.934	.970
65	7.50	8.10	6.79	7.88	12.30	9.18	1.193	1.027	.658	.883
66	9.00	8.20	7.06	9.16	12.53	9.82	1.161	.895	.654	.835
67	4.90	5.00	4.93	5.12	5.64	5.40	1.014	.977	.886	.927
68	5.00	5.70	4.93	5.12	5.64	5.40	1.156	1.113	1.010	1.056
69	7.70	8.40	7.06	7.68	5.76	6.68	1.190	1.094	1.459	1.258
70	8.00	8.65	7.06	7.68	5.76	6.68	1.225	1.126	1.503	1.296
71	8.50	9.65	7.60	8.44	6.63	8.60	1.270	1.143	1.457	1.123
72	7.50	8.65	7.06	7.68	5.76	6.68	1.225	1.126	1.503	1.296
73	8.90	10.00	7.60	8.44	6.63	8.60	1.316	1.185	1.509	1.163
74	9.75	10.00	7.60	8.44	6.63	8.60	1.316	1.185	1.509	1.163
75	3.80	5.10	3.38	3.21	7.51	5.83	1.509	1.589	.679	.874
76	3.50	3.90	3.38	3.21	7.51	5.83	1.154	1.215	.519	.669
77	2.75	5.30	2.79	2.31	7.48	5.51	1.900	2.299	.708	.961
78	2.90	3.10	2.79	2.31	7.48	5.51	1.111	1.345	.414	.562
79	6.00	6.20	4.89	5.33	6.60	6.88	1.268	1.162	.939	.901
80	6.80	7.05	5.90	6.48	6.69	7.18	1.195	1.089	1.054	.982
81	8.75	8.95	7.58	8.41	6.77	7.44	1.181	1.064	1.322	1.203
82	11.50	11.80	9.86	11.05	6.87	7.68	1.197	1.068	1.718	1.536
83	6.50	7.25	6.66	7.43	5.94	6.86	1.089	.976	1.221	1.057
84	9.75	9.75	10.31	11.62	6.14	7.35	.946	.839	1.588	1.326
85	10.00	10.75	10.31	11.62	9.25	8.44	1.043	.925	1.162	1.274
86	8.50	9.00	7.31	8.32	7.07	8.78	1.231	1.082	1.272	1.025
87	9.50	10.10	10.87	12.44	6.55	9.27	.929	.812	1.541	1.089
88	11.50	11.90	10.87	12.44	9.67	10.36	1.095	.956	1.231	1.149
89	11.00	11.30	12.49	15.64	9.53	10.36	.905	.723	1.186	1.091
90	7.75	8.35	6.70	7.43	6.03	6.97	1.246	1.124	1.386	1.198

TABLE A5 - 3
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
91	10.50	10.75	10.35	11.62	6.22	7.49	1.039	.925	1.727	1.436
92	11.25	11.65	10.35	11.62	9.34	8.57	1.126	1.002	1.248	1.359
93	10.00	10.00	7.74	8.88	6.79	8.89	1.292	1.127	1.474	1.125
94	11.00	12.50	11.36	13.03	6.59	9.41	1.100	.959	1.897	1.329
95	13.00	13.65	11.36	13.03	9.70	10.49	1.202	1.047	1.407	1.301
96	14.00	14.50	12.90	16.24	9.59	10.49	1.124	.893	1.512	1.382
97	7.50	7.65	6.80	7.43	6.23	7.26	1.125	1.030	1.227	1.053
98	9.00	9.75	10.44	11.62	6.43	7.83	.934	.839	1.516	1.246
99	11.00	11.25	10.44	11.62	9.55	8.91	1.078	.968	1.178	1.263
100	10.00	10.40	8.72	11.27	6.64	9.18	1.193	.923	1.567	1.132
101	12.00	12.35	12.39	15.46	6.72	9.75	.997	.799	1.839	1.267
102	12.00	13.20	12.39	15.46	9.83	10.83	1.065	.854	1.343	1.219
103	13.00	13.50	13.02	14.85	9.52	8.91	1.037	.909	1.419	1.515
104	7.50	8.70	6.89	7.44	6.38	7.49	1.263	1.170	1.363	1.162
105	8.00	8.50	10.51	11.62	6.59	8.09	.809	.731	1.291	1.051
106	11.00	11.50	10.51	11.62	9.70	9.17	1.094	.989	1.186	1.254
107	10.00	10.50	9.08	11.27	6.72	9.41	1.156	.932	1.562	1.116
108	11.00	11.20	12.75	15.46	6.85	10.01	.878	.724	1.636	1.119
109	12.50	13.50	12.75	15.46	9.96	11.09	1.059	.873	1.355	1.217
110	13.00	13.70	13.13	14.85	9.67	9.17	1.043	.922	1.417	1.493
111	17.00	17.95	18.26	21.12	19.35	16.66	.983	.850	.928	1.077
112	19.50	22.00	18.26	21.12	28.44	19.13	1.205	1.041	.774	1.150
113	22.00	23.00	24.72	29.76	14.80	19.13	.930	.773	1.554	1.202
114	25.00	25.50	24.50	29.76	19.72	20.48	1.041	.857	1.293	1.245
115	28.00	29.90	24.60	29.76	28.92	23.14	1.215	1.005	1.034	1.292
116	26.50	27.50	24.53	29.76	37.66	24.93	1.121	.924	.730	1.103
117	25.50	27.00	25.74	33.47	20.18	22.40	1.049	.807	1.338	1.205
118	28.00	28.50	25.74	33.47	29.26	24.87	1.107	.852	.974	1.146
119	27.00	28.53	25.77	33.47	38.10	26.83	1.107	.852	.749	1.063
120	26.00	26.88	24.67	29.76	29.01	23.29	1.090	.903	.927	1.154
121	27.70	27.90	25.46	33.47	29.22	24.76	1.096	.834	.955	1.127
122	25.00	27.40	24.60	29.76	39.53	25.44	1.114	.921	.693	1.077
123	29.00	30.00	25.46	33.47	39.83	27.06	1.178	.896	.753	1.109
124	24.50	26.00	24.60	29.76	29.17	23.20	1.057	.874	.891	1.121
125	26.00	27.00	24.56	29.76	38.30	25.10	1.099	.907	.705	1.076
126	16.00	17.05	29.11	33.62	7.01	13.18	.586	.507	2.432	1.294
127	31.00	32.10	38.98	47.06	7.76	17.21	.823	.682	4.138	1.865
128	0.00	28.95	41.20	52.82	8.24	18.94	.703	.548	3.511	1.528
129	27.50	27.50	29.15	33.62	15.51	19.89	.943	.818	1.773	1.382
130	31.50	35.35	39.05	47.06	16.25	23.92	.905	.751	2.175	1.478
131	35.00	36.00	41.43	52.82	16.73	25.65	.869	.682	2.152	1.403
132	27.50	30.45	28.83	33.62	20.63	20.51	1.056	.906	1.476	1.484
133	35.00	35.00	38.32	47.06	21.39	24.55	.913	.744	1.636	1.426
134	37.00	38.40	38.06	46.12	22.06	26.27	1.009	.833	1.740	1.461
135	29.50	31.60	29.03	33.62	30.79	23.87	1.089	.940	1.026	1.324

TABLE A5 - 4
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
136	34.50	37.45	38.84	47.06	31.54	27.90	.964	.796	1.187	1.342
137	37.50	40.50	40.72	52.82	32.05	29.63	.995	.767	1.264	1.367
138	29.00	31.40	28.93	33.62	40.21	25.53	1.085	.934	.781	1.230
139	34.00	39.00	33.68	47.06	40.96	29.56	1.008	.829	.952	1.319
140	36.00	39.10	39.56	52.82	41.54	31.29	.988	.740	.941	1.250
141	0.00	2.87	3.87	5.71	1.27	2.69	.742	.503	2.256	1.066
142	0.00	2.53	4.24	6.36	1.03	1.92	.597	.397	2.465	1.319
143	0.00	2.22	3.92	5.79	.99	1.57	.566	.383	2.248	1.411
144	0.00	1.82	3.81	5.59	.98	1.45	.478	.326	1.866	1.252
145	0.00	1.67	3.66	5.35	.96	1.31	.456	.312	1.737	1.276
146	0.00	3.39	3.66	5.37	1.57	2.93	.926	.632	2.156	1.156
147	0.00	2.99	4.42	6.55	1.14	2.21	.676	.456	2.631	1.351
148	0.00	2.51	4.03	5.86	1.09	1.80	.623	.428	2.305	1.396
149	0.00	2.33	3.92	5.66	1.08	1.68	.594	.412	2.164	1.388
150	0.00	1.61	3.73	5.35	1.06	1.49	.432	.301	1.520	1.078
151	0.00	3.02	6.14	9.23	1.09	2.27	.492	.327	2.777	1.332
152	0.00	2.10	4.11	6.19	.96	1.73	.511	.339	2.181	1.217
153	0.00	2.38	4.18	6.29	1.00	1.98	.569	.378	2.380	1.201
154	0.00	3.35	6.33	9.37	1.21	2.61	.529	.358	2.776	1.282
155	0.00	2.99	4.38	6.55	1.10	2.14	.683	.457	2.721	1.400
156	0.00	2.25	3.29	4.91	1.03	1.80	.684	.458	2.187	1.251
157	0.00	4.97	6.52	10.01	3.28	4.08	.762	.496	1.514	1.219
158	0.00	4.20	4.21	6.27	3.18	3.68	.998	.670	1.320	1.141
159	0.00	3.26	3.13	4.66	3.10	3.40	1.042	.699	1.050	.959
160	0.00	2.94	4.21	6.33	3.09	3.22	.698	.465	.953	.912
161	0.00	2.45	4.21	6.33	3.09	3.23	.582	.387	.794	.760
162	0.00	2.78	3.98	5.91	3.06	2.97	.698	.471	.909	.935
163	0.00	2.83	3.88	5.73	3.05	2.86	.729	.494	.929	.988
164	0.00	3.16	3.65	5.35	3.02	2.64	.866	.591	1.045	1.198
165	0.00	2.12	4.02	6.20	.87	1.59	.527	.342	2.428	1.334
166	0.00	2.82	3.92	5.91	2.98	3.11	.719	.477	.946	.907
167	0.00	2.94	3.89	5.87	3.39	3.26	.756	.501	.868	.901
168	0.00	2.74	3.94	5.94	4.37	3.49	.695	.461	.626	.785
169	0.00	3.14	3.85	5.80	5.07	3.75	.816	.542	.619	.838
170	0.00	3.36	3.79	5.71	7.17	4.24	.887	.588	.469	.793
171	0.00	3.86	3.68	5.54	1.97	2.95	1.049	.697	1.962	1.310
172	0.00	4.34	4.29	6.32	1.12	2.08	1.012	.687	3.890	2.091
173	0.00	3.44	4.53	6.79	3.37	3.76	.759	.507	1.022	.916
174	0.00	3.28	4.50	6.72	3.36	3.72	.729	.488	.976	.883
175	0.00	2.75	4.38	6.49	3.34	3.58	.628	.423	.823	.768
176	0.00	3.04	4.44	6.62	3.35	3.65	.685	.460	.907	.832
177	0.00	3.60	4.56	6.86	3.37	3.80	.789	.525	1.067	.948
178	0.00	88.00	140.65	136.72	50.94	70.07	.626	.644	1.727	1.256
179	0.00	85.00	141.09	136.72	51.33	71.26	.602	.622	1.656	1.193
180	0.00	75.00	141.46	136.72	51.68	72.33	.530	.549	1.451	1.037

TABLE A5 - 5
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
181	0.00	81.00	137.88	134.06	37.34	64.48	.587	.604	2.169	1.256
182	0.00	76.00	136.64	134.06	36.39	61.71	.556	.567	2.089	1.232
183	0.00	68.50	136.80	134.06	36.50	62.03	.501	.511	1.877	1.104
184	0.00	70.00	137.88	134.06	42.72	66.83	.508	.522	1.638	1.047
185	0.00	68.50	141.09	136.72	43.25	68.29	.486	.501	1.584	1.003
186	0.00	65.00	140.07	136.72	42.40	65.72	.464	.475	1.533	.989
187	0.00	71.00	138.23	136.72	49.22	65.13	.514	.519	1.442	1.090
188	0.00	72.50	137.39	136.72	48.74	63.84	.528	.530	1.487	1.136
189	0.00	62.50	134.68	136.72	47.48	60.62	.464	.457	1.316	1.031
190	0.00	55.00	138.23	136.72	35.76	59.82	.398	.402	1.538	.919
191	0.00	53.75	137.39	136.72	35.28	58.53	.391	.393	1.524	.918
192	0.00	45.00	134.68	136.72	34.01	55.31	.334	.329	1.323	.814
193	0.00	54.50	138.23	136.72	36.43	60.14	.394	.399	1.496	.906
194	0.00	55.00	137.39	136.72	35.95	58.85	.400	.402	1.530	.935
195	0.00	47.90	134.68	136.72	34.69	55.63	.356	.350	1.381	.861
196	37.40	38.50	36.58	43.18	48.85	40.97	1.052	.892	.788	.940
197	37.60	39.50	36.14	43.18	36.67	37.82	1.093	.915	1.077	1.044
198	39.00	40.00	36.25	43.18	60.51	43.06	1.103	.926	.661	.929
199	35.00	37.00	35.95	43.18	33.12	36.73	1.029	.857	1.117	1.007
200	35.00	37.50	36.40	43.18	48.82	40.84	1.030	.869	.768	.918
201	35.00	37.00	36.22	43.18	60.50	43.04	1.022	.857	.612	.860
202	37.50	38.50	36.44	43.18	36.72	38.02	1.057	.892	1.049	1.013
203	40.00	41.50	36.65	43.18	48.87	41.02	1.132	.961	.849	1.012
204	37.80	40.50	36.33	43.18	60.52	43.11	1.115	.938	.669	.939
205	6.20	7.00	6.69	6.93	6.05	6.06	1.046	1.011	1.157	1.156
206	9.05	9.60	6.32	6.59	6.78	7.98	1.519	1.457	1.416	1.203
207	9.75	10.75	10.03	10.39	6.18	7.06	1.072	1.035	1.739	1.522
208	13.50	13.80	9.48	9.88	7.28	8.98	1.456	1.397	1.897	1.537
209	6.63	6.70	6.69	6.93	9.41	7.15	1.001	.967	.712	.937
210	8.65	9.25	6.32	6.59	10.14	9.07	1.464	1.404	.912	1.020
211	10.75	11.00	10.03	10.39	9.54	8.15	1.097	1.059	1.153	1.349
212	13.00	13.95	9.48	9.88	10.63	10.07	1.472	1.412	1.312	1.385
213	6.85	7.20	6.69	6.93	4.37	5.29	1.076	1.040	1.646	1.362
214	7.65	8.45	6.32	6.59	5.10	7.21	1.337	1.283	1.656	1.173
215	0.00	8.60	10.03	10.39	4.50	6.29	.857	.828	1.909	1.368
216	0.00	9.15	9.48	9.88	5.60	8.21	.965	.926	1.635	1.115
217	0.00	12.40	9.79	11.30	11.46	11.06	1.267	1.097	1.082	1.121
218	0.00	12.30	9.79	11.30	7.88	9.95	1.256	1.089	1.562	1.236
219	7.50	8.30	6.69	6.50	8.63	8.45	1.241	1.277	.962	.983
220	7.50	8.00	6.69	6.50	6.00	7.45	1.196	1.231	1.334	1.075
221	14.00	14.20	9.75	10.16	12.81	13.62	1.456	1.397	1.109	1.042
222	14.00	14.05	9.75	10.16	7.79	12.29	1.441	1.382	1.804	1.144
223	13.10	13.80	12.50	14.00	11.45	11.62	1.104	.985	1.205	1.187
224	13.20	13.85	12.50	14.00	7.86	10.52	1.108	.989	1.761	1.316
225	10.00	10.35	9.79	11.30	11.46	11.06	1.057	.916	.903	.936

TABLE A5 - 6
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
226	10.00	10.50	9.79	11.30	7.88	9.95	1.073	.929	1.333	1.055
227	11.60	12.00	9.75	10.16	12.81	13.62	1.231	1.181	.937	.881
228	12.20	12.40	9.75	10.16	7.79	12.29	1.272	1.220	1.592	1.009
229	0.00	4.16	3.75	3.64	4.74	5.11	1.109	1.143	.878	.814
230	0.00	4.08	3.74	3.64	4.67	5.04	1.091	1.121	.874	.809
231	0.00	5.20	5.27	5.72	4.88	5.94	.987	.909	1.066	.875
232	0.00	5.95	5.11	5.72	4.76	5.81	1.164	1.040	1.249	1.023
233	0.00	6.88	5.70	6.23	4.79	5.90	1.207	1.104	1.436	1.167
234	0.00	6.85	5.62	6.23	4.73	5.84	1.219	1.099	1.447	1.174
235	12.00	12.40	13.51	13.43	13.81	15.73	.918	.923	.898	.788
236	8.90	9.20	10.07	9.70	13.97	14.79	.914	.948	.658	.622
237	0.00	18.00	33.89	33.53	15.17	24.02	.531	.537	1.187	.749
238	0.00	25.00	29.77	29.13	14.95	23.14	.840	.858	1.672	1.081
239	0.00	4.00	2.78	2.94	4.12	4.01	1.439	1.361	.970	.997
240	0.00	3.90	2.78	2.94	4.12	4.01	1.403	1.327	.946	.972
241	0.00	3.80	2.78	2.94	4.12	4.01	1.367	1.293	.922	.948
242	0.00	4.80	3.32	3.55	3.45	5.09	1.446	1.351	1.392	.943
243	0.00	4.60	3.32	3.55	3.45	5.09	1.386	1.294	1.334	.904
244	0.00	4.60	3.32	3.55	3.45	5.09	1.386	1.294	1.334	.904
245	0.00	4.40	2.78	2.94	6.72	4.75	1.583	1.498	.655	.926
246	0.00	3.80	2.78	2.94	6.72	4.75	1.367	1.293	.566	.800
247	0.00	4.50	3.32	3.55	6.04	5.83	1.355	1.266	.745	.772
248	0.00	5.00	3.32	3.55	6.04	5.83	1.506	1.407	.828	.857
249	0.00	5.80	3.32	3.55	6.04	5.83	1.747	1.632	.960	.995
250	0.00	5.70	3.32	3.55	6.04	5.83	1.717	1.604	.944	.977
251	0.00	4.10	2.97	3.10	4.24	4.19	1.380	1.323	.967	.978
252	0.00	4.20	2.97	3.10	4.24	4.19	1.414	1.356	.991	1.002
253	0.00	4.50	2.97	3.10	4.24	4.19	1.515	1.453	1.062	1.074
254	0.00	5.50	3.95	4.41	5.93	5.27	1.392	1.248	.927	1.043
255	0.00	6.00	3.95	4.41	5.93	5.27	1.519	1.362	1.011	1.138
256	0.00	6.20	3.95	4.41	5.93	5.27	1.570	1.407	1.045	1.176
257	0.00	4.50	2.97	3.10	6.83	4.93	1.515	1.453	.659	.912
258	0.00	4.40	2.97	3.10	6.83	4.93	1.481	1.420	.644	.892
259	0.00	4.00	2.97	3.10	6.83	4.93	1.347	1.291	.585	.811
260	0.00	6.10	3.95	4.41	8.53	6.01	1.544	1.384	.715	1.015
261	0.00	6.70	3.95	4.41	8.53	6.01	1.696	1.521	.786	1.114
262	0.00	6.30	3.95	4.41	8.53	6.01	1.595	1.430	.739	1.048
263	0.00	3.50	2.76	2.94	4.09	3.98	1.268	1.191	.855	.880
264	0.00	3.50	2.76	2.94	4.09	3.98	1.268	1.191	.855	.880
265	0.00	4.10	3.18	3.36	3.56	5.06	1.289	1.219	1.153	.811
266	0.00	3.75	3.18	3.36	3.56	5.06	1.179	1.115	1.055	.742
267	0.00	3.50	2.76	2.94	6.69	4.72	1.268	1.191	.523	.742
268	0.00	4.10	2.76	2.94	6.69	4.72	1.486	1.395	.613	.869
269	0.00	4.10	3.18	3.36	6.15	5.80	1.289	1.219	.667	.707
270	0.00	4.10	3.18	3.36	6.15	5.80	1.289	1.219	.667	.707

TABLE A5 - 7
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
271	0.00	3.75	2.81	3.00	4.08	3.98	1.335	1.250	.919	.943
272	0.00	3.75	2.81	3.00	4.08	3.98	1.335	1.250	.919	.943
273	0.00	4.70	3.13	3.29	3.55	5.06	1.502	1.427	1.326	.930
274	0.00	4.10	3.13	3.29	3.55	5.06	1.310	1.245	1.157	.811
275	0.00	4.00	2.81	3.00	6.67	4.72	1.423	1.333	.599	.848
276	0.00	3.50	2.81	3.00	6.67	4.72	1.246	1.166	.524	.742
277	0.00	4.50	3.13	3.29	6.14	5.80	1.438	1.366	.733	.776
278	0.00	4.75	3.13	3.29	6.14	5.80	1.518	1.442	.774	.819
279	0.00	11.30	10.96	11.55	7.78	8.43	1.031	.979	1.452	1.340
280	0.00	9.42	10.96	11.55	5.72	7.74	.859	.816	1.647	1.216
281	0.00	8.67	10.96	11.55	4.67	7.25	.791	.751	1.858	1.196
282	0.00	7.03	10.96	11.55	3.61	6.05	.641	.609	1.947	1.162
283	0.00	12.20	12.86	13.39	-2.12	8.05	.949	.911	-5.752	1.515
284	0.00	7.00	7.66	10.15	4.22	6.03	.914	.690	1.657	1.161
285	0.00	4.79	5.11	6.77	3.52	5.02	.937	.708	1.361	.954
286	0.00	4.10	4.17	4.38	2.41	3.59	.983	.937	1.699	1.143
287	0.00	2.09	2.06	1.99	2.26	2.15	1.015	1.051	.924	.970
288	0.00	3.75	3.83	5.07	3.18	4.50	.979	.739	1.178	.833
289	0.00	14.40	26.93	29.70	7.46	11.65	.535	.485	1.930	1.236
290	0.00	12.20	13.46	14.85	4.70	7.58	.906	.821	2.595	1.608
291	0.00	14.50	8.98	9.90	3.77	6.00	1.615	1.464	3.849	2.416
292	0.00	7.26	4.05	3.98	2.17	3.60	1.793	1.826	3.353	2.016
293	0.00	12.70	25.64	28.29	7.21	11.37	.495	.449	1.762	1.117
294	0.00	9.40	12.82	14.14	4.57	7.37	.733	.665	2.058	1.276
295	0.00	9.50	8.55	9.43	3.68	5.85	1.111	1.007	2.580	1.623
296	0.00	4.80	3.86	3.79	2.15	3.45	1.244	1.268	2.229	1.390
297	0.00	9.10	20.02	21.48	2.88	8.45	.455	.424	3.158	1.077
298	0.00	7.00	10.01	10.74	2.26	5.10	.699	.652	3.091	1.371
299	0.00	7.10	6.67	7.16	2.06	3.84	1.064	.992	3.448	1.848
300	0.00	6.00	5.01	5.37	1.96	3.16	1.198	1.117	3.068	1.899
301	0.00	6.60	12.20	12.33	2.27	7.18	.541	.535	2.910	.919
302	0.00	6.50	6.10	6.17	1.93	3.98	1.066	1.054	3.374	1.635
303	0.00	3.80	4.07	4.11	1.81	2.76	.934	.924	2.097	1.375
304	0.00	3.90	3.05	3.08	1.76	2.11	1.279	1.265	2.222	1.849
305	0.00	10.85	10.15	12.62	15.97	16.73	1.069	.860	.679	.649
306	0.00	10.30	9.14	10.99	14.79	12.72	1.127	.937	.696	.810
307	0.00	8.30	7.40	8.84	13.15	16.11	1.122	.939	.631	.515
308	0.00	7.00	6.20	7.14	14.65	12.10	1.129	.980	.478	.579
309	0.00	10.00	9.14	10.99	14.79	12.72	1.094	.910	.676	.786
310	0.00	8.75	7.40	8.84	13.15	16.11	1.182	.990	.665	.543
311	0.00	8.50	8.51	10.58	14.62	14.12	.999	.804	.582	.602
312	0.00	9.75	8.62	10.65	14.20	11.78	1.131	.916	.687	.828
313	0.00	6.90	5.82	6.73	13.23	14.87	1.186	1.025	.521	.464
314	0.00	6.50	5.69	6.81	14.06	11.27	1.142	.954	.462	.577
315	0.00	12.60	10.56	12.55	14.27	22.62	1.193	1.004	.883	.557

TABLE A5- 8
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
316	0.00	11.00	8.28	8.99	14.88	21.85	1.329	1.224	.739	.504
317	0.00	13.60	11.91	17.77	17.01	19.14	1.142	.765	.800	.711
318	0.00	10.30	9.21	13.93	13.54	18.37	1.118	.740	.761	.561
319	0.00	12.25	11.20	13.44	15.69	15.67	1.094	.912	.781	.782
320	0.00	8.90	8.24	9.59	15.57	14.90	1.080	.928	.572	.597
335	0.00	21.00	27.99	27.44	16.71	23.16	.750	.765	1.257	.907
336	0.00	23.00	27.99	27.44	25.92	26.41	.822	.838	.887	.871
337	0.00	22.60	28.01	27.44	38.05	29.71	.807	.824	.594	.761
338	0.00	26.00	28.12	27.44	53.75	33.65	.925	.948	.484	.773
339	0.00	26.80	32.67	32.44	29.45	28.48	.820	.826	.910	.941
340	0.00	29.00	32.83	32.44	45.06	32.87	.883	.894	.644	.882
341	0.00	18.00	32.83	32.44	15.20	24.06	.548	.555	1.184	.748
342	0.00	25.00	28.12	27.44	14.95	23.06	.889	.911	1.672	1.084
343	4.20	5.10	4.39	4.43	7.76	7.44	1.162	1.151	.657	.685
344	4.25	4.75	4.39	4.43	5.70	6.68	1.082	1.072	.833	.711
345	4.45	4.65	4.39	4.43	5.70	6.68	1.059	1.049	.816	.696
346	4.30	4.90	4.39	4.43	7.76	7.44	1.116	1.106	.631	.658
347	4.15	4.80	4.39	4.43	10.26	8.18	1.093	1.083	.468	.587
348	4.30	6.00	4.39	4.43	10.26	8.18	1.367	1.354	.585	.733
349	4.00	4.55	4.39	4.43	12.75	8.80	1.036	1.027	.357	.517
350	4.20	5.55	4.39	4.43	10.26	8.18	1.264	1.252	.541	.678
351	8.70	9.60	7.91	8.70	7.96	8.72	1.214	1.104	1.205	1.101
352	8.90	9.40	7.91	8.70	13.28	10.16	1.188	1.081	.708	.925
353	8.50	10.60	7.91	8.70	7.96	8.72	1.340	1.219	1.331	1.215
354	8.90	9.55	7.91	8.70	13.28	10.16	1.207	1.098	.719	.940
355	5.70	6.40	5.73	5.94	7.82	7.73	1.117	1.078	.818	.828
356	5.50	6.90	5.73	5.94	12.92	9.11	1.204	1.162	.534	.757
357	5.80	5.90	5.73	5.94	5.76	6.96	1.030	.994	1.024	.847
358	5.90	6.10	5.73	5.94	7.82	7.73	1.065	1.027	.780	.789
359	5.75	6.60	5.73	5.94	7.82	7.73	1.152	1.112	.844	.854
360	5.90	6.10	5.73	5.94	10.32	8.47	1.065	1.027	.591	.721
361	5.95	6.00	5.73	5.94	12.81	9.09	1.047	1.011	.468	.660
362	5.80	6.10	5.73	5.94	12.92	9.11	1.065	1.027	.472	.669
363	5.75	6.00	5.73	5.94	12.92	9.11	1.047	1.011	.464	.658
364	5.90	6.45	5.73	5.94	18.02	10.18	1.126	1.086	.358	.634
365	5.70	7.60	5.73	5.94	18.02	10.18	1.326	1.280	.422	.747
366	10.40	11.80	9.20	10.20	13.01	10.37	1.283	1.156	.907	1.138
367	9.90	10.60	9.20	10.20	13.01	10.37	1.152	1.039	.815	1.022
368	9.90	10.20	9.20	10.20	13.12	10.39	1.109	1.000	.777	.981
369	8.50	9.75	7.91	8.70	12.95	10.08	1.233	1.121	.753	.967
372	7.50	7.60	6.01	6.85	6.46	6.77	1.265	1.109	1.177	1.123
373	9.00	9.00	8.10	9.34	6.56	7.09	1.111	.964	1.372	1.269
374	0.00	11.15	10.24	11.67	6.85	7.63	1.089	.956	1.628	1.461
375	0.00	12.25	11.50	13.09	6.85	7.70	1.065	.936	1.788	1.591
376	9.00	9.50	8.17	9.34	10.44	8.40	1.163	1.017	.910	1.131

TABLE A5 - 9
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
377	9.00	9.05	8.16	9.34	4.68	6.32	1.109	.969	1.934	1.432
378	8.25	8.45	8.04	8.07	7.24	7.33	1.051	1.047	1.168	1.152
379	8.40	8.40	8.57	8.59	7.17	7.25	.980	.978	1.171	1.158
380	8.05	8.55	8.43	8.45	7.23	7.33	1.014	1.012	1.183	1.166
381	8.00	8.00	8.04	8.07	9.51	8.06	.995	.992	.841	.993
382	9.30	9.55	8.04	8.07	9.51	8.06	1.188	1.184	1.004	1.185
383	11.50	11.60	10.74	11.91	8.14	10.12	1.080	.974	1.425	1.146
384	11.50	11.60	11.26	12.43	8.02	10.02	1.030	.933	1.447	1.158
385	11.80	11.80	11.12	12.29	8.10	10.12	1.061	.960	1.456	1.166
386	11.50	11.80	10.74	11.91	10.41	10.85	1.099	.991	1.133	1.088
387	12.50	12.70	10.74	11.91	10.41	10.85	1.182	1.067	1.220	1.171
388	0.00	11.30	28.01	42.31	2.88	6.39	.403	.267	3.925	1.770
389	0.00	12.80	28.01	42.31	6.40	8.87	.457	.302	2.001	1.444
390	0.00	14.35	28.01	42.31	9.91	9.89	.512	.339	1.448	1.451
391	0.00	14.45	28.01	42.31	17.78	11.49	.516	.341	.813	1.257
392	0.00	6.75	5.88	7.94	5.32	5.62	1.148	.851	1.268	1.201
393	0.00	5.50	9.40	13.70	1.98	3.51	.585	.401	2.774	1.568
394	0.00	7.25	9.40	13.70	5.47	5.98	.771	.529	1.326	1.213
395	0.00	8.20	9.40	13.70	9.02	7.01	.872	.598	.910	1.169
396	0.00	9.95	9.85	12.46	6.10	7.14	1.010	.799	1.630	1.394
397	0.00	12.20	9.85	12.46	9.62	8.17	1.239	.979	1.268	1.494
398	0.00	5.95	14.00	21.16	2.21	3.82	.425	.281	2.690	1.558
399	0.00	7.75	14.00	21.16	5.73	6.30	.554	.366	1.353	1.230
400	0.00	10.10	14.00	21.16	9.24	7.33	.721	.477	1.093	1.378
401	0.00	10.50	14.00	21.16	17.12	8.93	.750	.496	.613	1.176
402	0.00	6.60	9.34	14.10	5.51	5.38	.707	.468	1.199	1.227
403	0.00	7.80	15.35	21.16	2.52	4.43	.508	.369	3.100	1.760
404	0.00	10.50	15.35	21.16	6.03	6.91	.684	.496	1.740	1.519
405	0.00	11.65	15.35	21.16	9.55	7.94	.759	.551	1.220	1.467
406	0.00	12.20	15.35	21.16	17.42	9.54	.795	.577	.700	1.279
407	0.00	14.95	27.64	43.16	3.61	8.84	.541	.346	4.143	1.691
408	0.00	15.70	27.64	43.16	7.13	11.32	.568	.364	2.203	1.387
409	0.00	17.10	27.64	43.16	10.64	12.35	.619	.396	1.607	1.385
410	0.00	17.20	27.64	43.16	18.51	13.95	.622	.398	.929	1.233
411	0.00	7.85	5.95	8.48	6.53	7.56	1.319	.925	1.202	1.038
412	0.00	7.10	9.31	14.17	2.55	5.51	.763	.501	2.780	1.289
413	0.00	8.80	9.31	14.17	6.07	7.99	.945	.621	1.450	1.101
414	0.00	9.65	9.31	14.17	9.59	9.02	1.037	.681	1.007	1.070
415	0.00	7.10	9.31	12.94	2.55	5.51	.763	.549	2.780	1.289
416	0.00	8.85	9.31	12.94	6.07	7.99	.951	.684	1.458	1.108
417	0.00	9.70	9.31	12.94	9.59	9.02	1.042	.750	1.012	1.076
418	0.00	7.10	13.82	21.58	2.70	5.87	.514	.329	2.634	1.210
419	0.00	9.95	13.82	21.58	6.21	8.35	.720	.461	1.602	1.192
420	0.00	11.45	13.82	21.58	9.73	9.38	.829	.531	1.177	1.221
421	0.00	12.10	13.82	21.58	17.60	10.98	.876	.561	.687	1.102

TABLE A5 -10
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
422	0.00	8.25	9.21	14.39	5.91	7.28	.896	.573	1.397	1.133
423	0.00	9.25	16.20	24.35	3.12	7.03	.571	.380	2.961	1.315
424	0.00	12.10	16.20	24.35	6.64	9.52	.747	.497	1.822	1.272
425	0.00	14.65	16.20	24.35	10.16	10.54	.904	.602	1.442	1.390
426	0.00	14.70	16.20	24.35	18.03	12.14	.907	.604	.815	1.211
427	0.00	17.40	27.74	41.47	5.01	11.59	.627	.420	3.470	1.501
428	0.00	17.95	27.74	41.47	8.53	14.07	.647	.433	2.104	1.276
429	0.00	19.05	27.74	41.47	12.05	15.10	.687	.459	1.581	1.262
430	0.00	20.20	27.74	41.47	19.92	16.70	.728	.487	1.014	1.210
431	0.00	9.30	6.23	7.94	5.06	9.69	1.493	1.172	1.838	.960
432	0.00	8.15	9.46	13.45	5.47	7.71	.862	.606	1.490	1.058
433	0.00	11.40	9.46	13.45	8.99	10.19	1.205	.848	1.269	1.119
434	0.00	11.70	9.46	13.45	12.18	11.13	1.237	.870	.960	1.051
435	0.00	9.00	9.46	12.25	5.47	7.71	.951	.735	1.645	1.168
436	0.00	10.05	9.46	12.25	8.99	10.19	1.062	.821	1.118	.987
437	0.00	11.25	9.46	12.25	12.50	11.21	1.189	.919	.900	1.003
438	0.00	8.15	13.87	20.73	3.52	8.13	.588	.393	2.312	1.003
439	0.00	11.70	13.87	20.73	7.04	10.61	.844	.564	1.662	1.103
440	0.00	13.30	13.87	20.73	10.56	11.63	.959	.641	1.260	1.143
441	0.00	14.15	13.87	20.73	18.43	13.23	1.020	.682	.768	1.069
442	0.00	9.05	9.25	13.82	6.54	9.36	.978	.655	1.383	.966
443	0.00	10.80	15.49	23.79	3.64	8.95	.697	.454	2.968	1.207
444	0.00	14.20	15.49	23.79	7.16	11.43	.917	.597	1.984	1.243
445	0.00	15.20	15.49	23.79	10.67	12.46	.981	.639	1.424	1.220
446	0.00	17.40	15.49	23.79	18.54	14.05	1.123	.732	.938	1.238
447	7.85	8.25	6.09	6.85	2.46	8.76	1.355	1.204	3.353	.942
448	8.05	8.55	6.09	6.85	2.46	8.76	1.404	1.248	3.475	.976
449	8.05	9.50	7.45	8.46	7.48	9.06	1.275	1.122	1.270	1.048
450	8.40	9.25	7.45	8.46	7.48	9.06	1.242	1.093	1.236	1.021
451	10.55	11.50	9.15	10.46	7.11	9.32	1.257	1.100	1.619	1.233
452	10.10	11.25	9.15	10.46	7.11	9.32	1.230	1.076	1.583	1.206
453	11.25	12.75	10.98	12.54	7.10	9.57	1.161	1.017	1.795	1.332
454	11.05	11.25	10.98	12.54	7.10	9.57	1.025	.897	1.584	1.175
455	17.80	18.10	20.15	21.57	45.98	22.12	.898	.839	.394	.818
456	19.00	19.30	20.15	21.57	45.98	22.12	.958	.895	.420	.872
457	18.30	18.40	20.15	21.57	32.43	19.97	.913	.853	.567	.921
458	18.00	18.30	20.15	21.57	32.43	19.97	.908	.848	.564	.916
459	16.60	17.60	19.99	21.57	45.72	21.53	.880	.816	.385	.817
460	16.50	16.50	19.99	21.57	45.72	21.53	.825	.765	.361	.766
461	16.50	17.00	19.99	21.57	32.18	19.38	.850	.788	.528	.877
462	15.50	16.00	19.99	21.57	32.18	19.38	.800	.742	.497	.826
463	9.10	9.80	10.07	10.79	23.19	14.02	.973	.908	.423	.699
464	6.40	11.10	10.07	10.79	23.19	14.02	1.102	1.029	.479	.792
465	10.10	11.00	10.07	10.79	14.04	11.71	1.092	1.020	.783	.939
466	9.80	10.00	10.07	10.79	14.04	11.71	.993	.927	.712	.854

TABLE A5 -11
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
467	9.00	10.10	10.07	10.79	23.19	14.02	1.003	.936	.436	.721
468	9.00	9.10	10.07	10.79	23.19	14.02	.904	.844	.392	.649
469	8.50	9.10	10.07	10.79	14.04	11.71	.904	.844	.648	.777
470	8.90	9.10	10.07	10.79	14.04	11.71	.904	.844	.648	.777
471	11.30	13.00	10.05	10.17	23.18	16.26	1.294	1.279	.561	.799
472	10.50	13.60	10.05	10.17	23.18	16.26	1.353	1.338	.587	.836
473	8.40	9.80	10.05	10.17	14.03	13.96	.975	.964	.698	.702
474	9.40	10.60	10.05	10.17	14.03	13.96	1.055	1.043	.755	.759
476	9.00	9.20	9.91	10.17	22.93	15.81	.928	.905	.401	.582
478	10.00	10.70	9.91	10.17	13.78	13.50	1.080	1.053	.776	.793
479	5.25	5.50	5.02	5.08	8.52	8.71	1.096	1.082	.646	.631
480	4.70	5.10	5.02	5.08	8.52	8.71	1.016	1.003	.599	.585
481	5.00	5.20	5.02	5.08	6.49	7.58	1.036	1.023	.801	.686
482	5.10	5.20	5.02	5.08	6.49	7.58	1.036	1.023	.801	.686
483	4.80	5.10	5.02	5.08	8.52	8.71	1.016	1.003	.599	.585
484	5.10	5.50	5.02	5.08	8.52	8.71	1.096	1.082	.646	.631
485	4.70	5.00	5.02	5.08	6.49	7.58	.996	.984	.770	.659
486	5.20	5.40	5.02	5.08	6.49	7.58	1.076	1.062	.832	.712
487	9.50	11.30	9.91	10.17	6.46	10.42	1.140	1.112	1.749	1.085
488	0.00	9.00	9.91	10.17	6.46	10.42	.908	.885	1.393	.864
489	10.60	14.30	11.00	11.24	23.14	16.44	1.300	1.272	.618	.870
490	11.10	12.50	11.00	11.24	23.14	16.44	1.136	1.112	.540	.760
491	10.70	11.50	11.00	11.24	23.19	16.45	1.045	1.023	.496	.699
492	10.30	12.00	11.00	11.24	23.19	16.45	1.091	1.068	.517	.730
493	17.50	17.50	15.92	19.52	33.96	19.79	1.099	.897	.515	.884
494	8.00	8.80	7.96	9.76	17.77	13.27	1.106	.902	.495	.663
495	9.30	9.30	7.96	9.76	10.97	11.28	1.168	.953	.847	.825
496	13.00	14.35	12.28	12.97	21.40	16.22	1.169	1.107	.671	.885
497	13.90	14.30	12.28	12.97	12.53	13.92	1.164	1.103	1.141	1.028
498	6.10	6.75	6.14	6.48	7.14	8.56	1.099	1.041	.946	.789
499	6.25	6.80	6.14	6.48	5.44	7.57	1.107	1.049	1.249	.899
500	17.00	17.85	17.05	18.38	43.91	21.19	1.047	.971	.406	.842
501	16.00	16.00	17.05	18.38	25.58	18.10	.938	.871	.626	.884
502	9.65	9.80	8.53	9.19	13.48	11.44	1.149	1.066	.727	.857
503	9.75	9.75	8.53	9.19	8.94	9.87	1.143	1.061	1.091	.987
504	13.00	13.60	13.10	15.47	45.76	19.39	1.038	.879	.297	.702
505	14.00	14.00	13.10	15.47	27.43	16.39	1.069	.905	.510	.854
506	11.60	12.40	11.21	12.19	28.16	15.26	1.106	1.017	.440	.813
507	12.00	12.75	11.21	12.19	15.52	12.46	1.137	1.046	.822	1.024
508	13.00	13.00	17.92	19.52	32.39	21.19	.725	.666	.401	.614
509	9.10	9.80	8.96	9.76	17.37	13.95	1.094	1.004	.564	.703
510	9.20	9.80	8.96	9.76	11.58	12.22	1.094	1.004	.846	.802
511	13.60	14.40	12.91	12.97	21.02	17.70	1.115	1.111	.685	.814
512	15.00	15.00	12.91	12.97	13.36	15.67	1.162	1.157	1.123	.957
513	5.90	7.10	6.46	6.48	8.16	9.61	1.099	1.095	.870	.739

TABLE A5 -12
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
514	6.30	7.30	6.46	6.48	6.34	8.58	1.130	1.126	1.151	.851
515	19.50	19.50	17.93	18.62	44.69	23.17	1.088	1.047	.436	.842
516	18.80	20.00	17.93	18.62	24.83	19.77	1.115	1.074	.806	1.012
517	8.40	9.90	8.96	9.31	14.33	12.51	1.105	1.063	.691	.791
518	9.10	9.20	8.96	9.31	10.10	11.09	1.027	.988	.911	.830
519	13.20	14.60	14.02	15.42	46.59	20.57	1.041	.947	.313	.710
520	13.80	13.80	14.02	15.42	26.66	17.27	.984	.895	.518	.799
521	8.30	12.10	11.49	12.14	27.42	16.14	1.053	.996	.441	.750
522	11.50	12.10	11.49	12.14	16.39	13.65	1.053	.996	.738	.886
523	80.00	82.00	72.02	77.05	134.92	87.27	1.139	1.064	.608	.940
524	41.70	44.00	36.01	38.52	73.13	57.45	1.222	1.142	.602	.766
525	39.70	39.70	36.01	38.52	46.47	49.60	1.102	1.031	.854	.800
526	56.70	58.50	51.23	50.85	84.12	72.34	1.142	1.150	.695	.809
527	60.70	63.30	51.23	50.85	50.03	63.04	1.236	1.245	1.265	1.004
528	26.30	28.10	25.61	25.42	32.93	39.13	1.097	1.105	.853	.718
529	25.20	27.20	25.61	25.42	26.22	35.32	1.062	1.070	1.038	.770
530	69.30	69.30	68.83	70.59	106.49	82.31	1.007	.982	.651	.842
531	32.20	34.00	34.41	35.29	57.92	51.05	.988	.963	.587	.666
532	34.70	35.80	34.41	35.29	51.36	49.02	1.040	1.014	.697	.730
533	35.80	35.80	34.41	35.29	46.11	47.24	1.040	1.014	.776	.758
534	34.30	36.30	34.41	35.29	38.63	44.36	1.055	1.029	.940	.818
535	60.30	60.30	55.37	60.26	109.35	70.54	1.089	1.001	.551	.855
536	53.00	53.00	44.98	47.16	111.78	65.91	1.178	1.124	.474	.804
537	51.70	51.70	44.98	47.16	67.68	56.08	1.149	1.096	.764	.922
538	21.00	23.50	19.92	19.52	23.67	23.60	1.180	1.204	.993	.996
539	10.00	11.50	9.96	9.76	13.70	14.80	1.155	1.178	.839	.777
540	11.50	12.10	9.96	9.76	10.11	13.40	1.215	1.240	1.197	.903
541	15.00	16.80	13.86	12.97	10.80	18.58	1.212	1.296	1.556	.904
542	15.00	15.90	13.86	12.97	8.54	17.44	1.147	1.226	1.862	.912
543	7.50	9.00	6.93	6.48	6.97	10.21	1.299	1.388	1.292	.881
544	18.00	21.20	20.07	19.72	27.38	25.01	1.056	1.075	.774	.848
545	18.00	22.00	20.07	19.72	17.25	22.63	1.096	1.116	1.275	.972
546	10.00	11.00	10.04	9.86	10.27	13.20	1.096	1.116	1.071	.833
547	9.60	11.10	10.04	9.86	8.20	12.10	1.106	1.126	1.354	.917
548	14.00	16.80	15.06	15.47	35.61	21.60	1.116	1.086	.472	.778
549	15.50	17.00	15.06	15.47	20.75	18.62	1.129	1.099	.819	.913
550	12.50	13.40	12.15	12.19	17.05	16.38	1.103	1.099	.786	.818
551	12.50	13.20	12.15	12.19	11.75	14.65	1.086	1.083	1.123	.901
552	20.25	20.50	18.32	19.52	30.27	21.38	1.119	1.050	.677	.959
553	13.50	14.40	13.08	12.97	11.78	15.67	1.101	1.111	1.222	.919
554	12.00	13.25	10.52	11.96	19.87	15.65	1.260	1.108	.667	.847
555	12.00	12.75	10.52	11.96	12.37	13.52	1.212	1.066	1.031	.943
556	9.70	10.10	9.16	9.76	15.64	13.74	1.103	1.035	.646	.735
557	10.00	10.40	9.16	9.76	10.20	11.94	1.135	1.066	1.020	.871
558	22.50	24.40	24.08	26.18	47.69	25.53	1.013	.932	.512	.956

TABLE A5 -13
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
559	17.65	19.25	18.98	19.60	28.27	21.10	1.014	.982	.681	.912
560	13.30	14.90	13.39	15.29	35.29	19.44	1.113	.975	.422	.766
561	11.80	13.05	12.04	13.09	28.05	17.29	1.084	.997	.465	.755
562	12.15	13.10	12.04	13.09	15.71	14.48	1.088	1.001	.834	.905
563	9.50	10.15	9.49	9.80	14.42	12.84	1.070	1.036	.704	.791
564	9.63	10.10	9.49	9.80	9.73	11.21	1.064	1.030	1.038	.901
565	15.00	15.00	14.23	15.47	22.37	16.73	1.054	.970	.670	.897
566	11.10	12.10	11.62	12.18	13.65	13.19	1.041	.994	.886	.917
594	12.00	12.00	11.35	11.53	8.75	12.84	1.057	1.041	1.372	.934
595	10.90	11.10	11.37	14.51	15.55	14.31	.976	.765	.714	.776
596	13.30	13.30	11.77	9.99	8.79	12.77	1.130	1.331	1.513	1.041
597	16.30	17.30	16.54	17.28	22.16	17.65	1.046	1.001	.781	.980
598	16.30	16.30	16.54	17.28	14.60	15.76	.985	.943	1.116	1.034
599	8.40	8.80	8.27	8.64	13.03	10.77	1.064	1.019	.676	.817
600	13.00	13.00	13.96	17.39	31.67	18.33	.931	.748	.410	.709
601	12.50	12.50	13.96	17.39	18.97	15.72	.895	.719	.659	.795
602	14.50	18.00	18.24	17.14	18.29	16.54	.987	1.050	.984	1.089
603	15.20	15.20	18.24	17.14	12.52	14.90	.833	.887	1.214	1.020
604	8.50	8.50	9.12	8.57	7.61	8.10	.932	.992	1.117	1.049
605	22.20	22.20	22.95	24.43	39.74	21.65	.967	.909	.559	1.025
606	10.20	11.50	11.47	12.21	20.86	13.23	1.003	.942	.551	.869
607	11.10	11.10	11.47	12.21	13.79	11.41	.968	.909	.805	.973
608	15.00	16.00	17.17	20.96	44.65	20.85	.932	.763	.358	.767
609	13.18	13.54	14.06	16.13	41.87	20.12	.963	.839	.323	.673
610	12.72	13.42	14.06	16.13	24.49	17.09	.954	.832	.548	.785
611	10.92	11.80	11.13	11.76	20.51	14.98	1.060	1.003	.575	.788
612	11.04	11.97	11.13	11.76	13.61	13.19	1.075	1.017	.879	.908
613	10.35	10.69	11.32	13.08	26.91	16.80	.944	.817	.397	.636
614	10.70	10.90	11.32	13.08	16.94	14.58	.963	.833	.643	.748
615	8.00	8.79	8.42	8.71	10.20	11.31	1.044	1.009	.862	.777
616	8.36	8.40	8.42	8.71	7.27	10.04	.998	.964	1.155	.837
617	7.92	8.17	8.84	10.07	22.21	14.05	.924	.811	.368	.582
618	7.91	8.36	8.84	10.07	14.41	12.11	.946	.830	.580	.690
619	7.15	7.37	7.35	7.89	14.68	10.92	1.003	.934	.502	.675
620	7.18	7.45	7.35	7.89	9.36	9.15	1.014	.945	.796	.814
621	6.19	6.28	7.03	8.07	14.95	11.93	.893	.779	.420	.526
622	6.20	6.67	7.03	8.07	9.62	10.18	.949	.827	.693	.655
623	5.26	5.49	5.56	5.88	8.21	8.35	.987	.933	.669	.658
624	5.40	5.40	7.03	8.07	10.04	10.35	.768	.670	.538	.522
625	14.70	15.22	14.70	15.78	24.37	16.46	1.035	.965	.624	.924
626	16.90	17.60	18.35	19.62	31.77	21.58	.959	.897	.554	.816
627	16.90	18.70	18.35	19.62	32.24	21.66	1.019	.953	.580	.863
628	17.40	17.80	17.96	21.72	27.90	23.52	.991	.820	.638	.757
629	9.10	10.50	9.48	9.81	12.31	13.14	1.108	1.070	.853	.799
630	9.10	10.20	9.48	9.81	12.18	13.10	1.076	1.040	.837	.779

TABLE A5 -14
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
631	9.30	10.40	9.44	10.86	10.80	14.35	1.102	.958	.963	.725
632	16.60	16.90	17.94	18.44	25.02	20.37	.942	.917	.675	.830
633	16.70	18.60	17.94	18.44	25.37	20.44	1.037	1.009	.733	.910
634	15.60	18.30	18.36	22.33	21.87	22.60	.997	.820	.837	.810
635	8.90	10.70	9.13	9.22	10.54	12.00	1.172	1.161	1.015	.891
636	8.50	10.70	9.13	9.22	10.54	12.00	1.172	1.161	1.015	.891
637	8.20	10.40	9.56	11.16	9.22	13.39	1.088	.932	1.128	.776
638	13.80	15.00	14.12	15.01	27.21	18.35	1.062	.999	.551	.817
639	14.80	16.20	14.12	15.01	28.15	18.53	1.147	1.079	.576	.874
640	13.60	15.00	13.68	17.74	23.80	19.89	1.096	.846	.630	.754
641	7.35	7.35	7.25	7.63	12.35	11.36	1.014	.963	.595	.647
642	6.85	7.60	7.25	7.63	12.35	11.36	1.048	.996	.615	.669
643	7.40	7.40	7.25	7.63	12.35	11.36	1.021	.970	.599	.651
645	22.90	27.30	23.05	26.46	64.98	31.91	1.184	1.032	.420	.855
646	22.60	25.70	23.05	26.46	64.98	31.91	1.115	.971	.396	.805
647	21.80	24.90	22.64	26.46	64.21	32.03	1.100	.941	.388	.777
648	21.00	23.60	21.10	26.46	61.12	32.54	1.118	.892	.386	.725
649	23.70	27.20	23.05	26.46	65.25	31.95	1.180	1.028	.417	.851
650	22.40	25.70	23.05	26.46	64.98	31.91	1.115	.971	.396	.805
651	21.80	25.90	23.05	26.46	64.98	31.91	1.124	.979	.399	.812
652	22.50	26.50	23.05	26.46	64.98	31.91	1.150	1.001	.408	.830
653	23.70	26.00	23.89	26.67	66.00	32.34	1.088	.975	.394	.804
654	24.30	26.40	23.47	26.67	65.23	32.46	1.125	.990	.405	.813
655	24.50	26.20	23.20	26.67	64.71	32.55	1.129	.982	.405	.805
656	22.60	24.80	21.44	26.67	61.09	33.17	1.157	.930	.406	.748
657	21.50	25.80	23.75	26.67	65.74	32.38	1.086	.967	.392	.797
658	25.00	26.20	23.75	26.67	65.74	32.38	1.103	.982	.399	.809
659	26.60	26.60	23.75	26.67	65.74	32.38	1.120	.997	.405	.821
660	9.20	9.90	9.20	9.74	13.50	12.12	1.076	1.017	.733	.817
661	9.00	9.80	9.19	9.71	13.49	12.13	1.066	1.009	.727	.808
662	7.50	7.60	7.44	7.84	10.10	10.07	1.022	.969	.752	.754
663	7.40	7.80	7.26	7.77	9.90	9.75	1.074	1.004	.788	.800
664	9.60	9.70	9.28	10.47	13.58	12.46	1.045	.926	.714	.779
665	9.50	9.50	9.36	10.49	13.71	12.59	1.015	.905	.693	.754
666	6.00	6.30	6.15	6.52	8.18	8.51	1.024	.967	.770	.741
667	5.90	6.20	6.16	6.52	8.22	8.55	1.006	.951	.754	.725
668	8.30	8.30	7.83	8.83	10.78	10.99	1.060	.940	.770	.755
669	8.00	8.30	7.75	8.83	10.67	10.87	1.071	.940	.778	.764
670	7.80	8.40	8.23	8.78	13.98	11.25	1.021	.957	.601	.747
671	8.10	8.60	8.07	8.70	13.61	10.89	1.066	.989	.632	.790
672	8.20	8.50	10.90	11.98	18.62	13.61	.780	.710	.456	.625
673	0.00	8.60	10.78	11.93	18.16	13.38	.798	.721	.473	.643
674	10.20	11.20	11.00	11.93	18.89	13.95	1.018	.939	.593	.803
675	11.80	12.60	14.26	15.55	37.17	18.05	.884	.810	.339	.698
676	0.00	13.70	16.08	17.64	35.81	17.97	.852	.776	.383	.762

TABLE A5 -15
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
677	0.00	13.70	15.89	17.64	36.88	17.65	.862	.776	.371	.776
678	6.50	6.80	8.17	8.98	12.40	10.77	.832	.757	.549	.631
679	7.30	7.30	8.32	8.98	12.95	11.22	.877	.813	.564	.651
680	8.00	8.30	8.25	8.94	12.68	11.04	1.006	.928	.655	.752
681	9.30	9.40	10.70	11.66	16.83	12.64	.879	.806	.559	.743
682	8.30	8.80	10.56	11.66	20.30	13.14	.833	.755	.434	.669
683	0.00	8.80	11.92	13.23	26.85	14.59	.738	.665	.328	.603
684	10.40	11.20	12.06	13.23	20.66	13.67	.929	.846	.542	.819
685	13.00	13.53	11.52	11.51	11.07	14.25	1.174	1.175	1.222	.950
686	17.30	19.00	16.99	17.75	18.33	17.30	1.118	1.070	1.036	1.099
687	18.00	18.00	17.12	17.75	11.66	15.76	1.051	1.014	1.543	1.142
688	19.70	23.40	22.35	23.58	25.96	20.62	1.047	.993	.901	1.135
689	17.00	19.30	15.99	16.51	16.41	17.56	1.207	1.169	1.176	1.099
690	21.60	23.30	21.31	22.75	23.01	20.17	1.093	1.024	1.012	1.155
691	22.50	23.40	19.02	21.51	19.09	18.63	1.230	1.088	1.226	1.256
692	25.30	26.80	24.71	27.75	25.41	21.64	1.085	.966	1.055	1.239
693	8.30	9.40	7.62	7.67	8.39	10.46	1.234	1.225	1.121	.898
694	11.70	16.00	11.52	11.83	13.71	13.83	1.389	1.352	1.167	1.157
695	11.70	12.70	11.42	11.83	9.05	11.81	1.112	1.073	1.403	1.075
696	14.30	15.50	14.86	15.72	18.46	15.44	1.043	.986	.840	1.004
697	12.10	12.50	10.49	11.01	11.83	13.06	1.192	1.136	1.057	.957
698	15.60	16.60	14.28	15.17	16.60	15.67	1.162	1.095	1.000	1.059
699	14.80	15.00	12.36	14.34	13.81	14.35	1.214	1.046	1.086	1.045
700	17.70	18.80	16.05	18.50	17.76	16.32	1.171	1.016	1.059	1.152
701	8.70	11.40	8.54	8.87	11.11	10.99	1.335	1.285	1.026	1.037
702	8.60	10.90	8.57	8.87	7.84	9.70	1.272	1.228	1.390	1.124
703	10.20	11.70	11.16	11.79	14.66	12.72	1.048	.993	.798	.920
704	8.30	10.90	8.58	8.87	12.64	11.62	1.270	1.228	.862	.938
705	8.50	11.40	8.54	8.87	11.10	10.98	1.335	1.285	1.027	1.038
706	8.50	9.00	7.84	8.26	9.91	10.92	1.148	1.090	.908	.824
707	10.60	11.60	10.38	11.37	12.92	12.32	1.118	1.020	.898	.942
708	10.33	12.80	10.47	11.37	14.48	12.93	1.223	1.125	.884	.990
709	11.50	12.33	10.58	11.37	13.22	12.74	1.165	1.084	.933	.967
710	10.33	11.00	9.42	10.76	11.42	12.37	1.168	1.023	.963	.889
711	13.63	14.10	11.91	13.87	14.11	13.69	1.184	1.016	.999	1.030
712	10.50	10.70	9.16	10.07	12.98	12.65	1.168	1.062	.825	.846
713	10.25	10.35	9.16	10.07	12.98	12.65	1.130	1.027	.798	.818
714	10.35	10.50	9.16	10.07	12.98	12.65	1.146	1.042	.809	.830
715	9.55	9.90	9.37	9.80	15.58	12.82	1.057	1.010	.635	.772
716	9.70	9.90	9.37	9.80	10.08	11.03	1.057	1.010	.983	.897
717	14.10	14.10	14.48	16.04	26.29	17.13	.974	.879	.536	.823
718	12.05	13.00	12.01	12.77	27.04	16.00	1.082	1.018	.481	.812
719	12.00	12.50	12.01	12.77	18.67	14.18	1.041	.979	.669	.881
720	12.25	12.50	12.01	12.77	18.67	14.18	1.041	.979	.669	.881
721	12.25	12.70	12.01	12.77	18.67	14.18	1.057	.995	.680	.895

TABLE A5 -16
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
722	13.30	14.25	12.25	13.15	20.77	15.77	1.163	1.083	.686	.904
723	13.40	13.85	12.25	13.15	20.77	15.77	1.131	1.053	.667	.878
724	14.00	14.50	12.42	13.36	12.12	13.49	1.167	1.085	1.196	1.075
725	12.90	13.45	12.42	13.36	12.12	13.49	1.083	1.007	1.110	.997
726	13.00	13.65	12.42	13.36	12.12	13.49	1.099	1.022	1.126	1.012
727	13.30	14.15	12.42	13.36	12.12	13.49	1.139	1.059	1.167	1.049
728	9.75	10.40	12.32	12.86	8.22	12.46	.844	.809	1.265	.834
729	5.50	5.85	5.95	6.43	7.53	8.55	.983	.910	.776	.684
730	11.60	12.70	16.67	18.15	25.54	17.66	.762	.700	.497	.719
731	6.75	7.85	8.33	9.08	7.76	9.22	.942	.865	1.012	.851
732	11.00	11.20	12.81	14.85	21.35	15.36	.874	.754	.525	.729
733	8.40	9.65	10.73	11.55	17.51	13.19	.899	.836	.551	.732
734	11.55	12.90	11.35	11.94	22.11	15.19	1.137	1.081	.583	.849
735	14.75	15.00	13.91	15.21	22.29	16.50	1.078	.986	.673	.909
736	11.85	12.70	11.35	11.94	22.73	15.32	1.119	1.064	.559	.829
737	14.50	15.25	13.91	15.21	22.90	16.63	1.096	1.003	.666	.917
738	14.25	15.65	12.79	13.56	22.15	15.34	1.224	1.154	.707	1.021
739	15.50	15.50	15.30	16.84	22.31	16.65	1.013	.920	.695	.931
740	14.20	16.15	12.79	13.56	22.76	15.47	1.263	1.191	.710	1.044
741	16.95	17.40	15.30	16.84	22.92	16.78	1.137	1.033	.759	1.037
742	10.50	11.30	9.18	9.50	18.77	13.94	1.231	1.190	.602	.811
743	12.75	13.35	11.73	12.77	18.95	15.25	1.138	1.045	.704	.876
744	9.90	11.00	9.18	9.50	18.84	13.95	1.198	1.158	.584	.788
745	12.95	13.80	11.73	12.77	19.02	15.26	1.176	1.081	.726	.904
746	10.25	11.30	8.52	8.75	18.75	13.79	1.326	1.292	.603	.820
747	12.85	13.70	11.07	12.02	18.93	15.10	1.238	1.140	.724	.908
748	10.35	11.35	8.52	8.75	18.81	13.80	1.332	1.298	.603	.822
749	12.90	13.15	11.07	12.02	19.00	15.11	1.188	1.094	.692	.870
750	9.20	10.05	9.27	9.78	13.33	11.99	1.084	1.028	.754	.838
751	7.37	7.77	7.38	7.82	9.86	9.77	1.053	.993	.788	.795
752	9.20	9.63	9.00	10.20	16.23	13.04	1.070	.945	.593	.739
753	6.05	6.48	6.13	6.47	8.16	8.46	1.057	1.002	.794	.766
754	7.70	8.00	7.34	8.50	12.37	11.15	1.090	.942	.647	.717
755	7.90	8.45	7.98	8.64	13.45	10.56	1.059	.978	.628	.800
756	10.00	10.85	9.98	10.55	12.49	12.39	1.087	1.029	.868	.875
757	10.19	11.05	9.93	10.55	12.40	12.25	1.113	1.048	.891	.902
758	6.34	6.70	6.20	6.47	7.23	8.64	1.081	1.035	.927	.775
759	6.20	6.54	6.17	6.40	7.29	8.71	1.060	1.023	.897	.751
760	6.67	7.27	4.77	4.75	7.17	7.90	1.524	1.530	1.013	.920
761	6.65	7.10	4.76	4.75	7.14	7.86	1.492	1.494	.994	.903
762	8.08	8.48	6.00	6.26	9.34	9.59	1.413	1.355	.908	.884
763	8.05	8.50	6.03	6.26	9.43	9.68	1.410	1.358	.902	.878
764	9.20	9.82	7.18	7.76	12.42	11.56	1.368	1.265	.791	.850
765	9.43	9.70	7.15	7.76	12.38	11.51	1.357	1.249	.784	.843
766	8.45	8.72	8.55	8.99	10.20	10.21	1.020	.970	.854	.854

TABLE A5 -17
TEST RESULTS AND CALCULATED VALUES
(SEE END OF TABLE FOR IDENTIFICATION OF COLUMN)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
767	8.30	8.72	8.55	8.99	10.20	10.21	1.020	.970	.854	.854
768	8.22	8.72	8.54	8.99	10.16	10.15	1.021	.970	.858	.859
769	8.30	8.75	8.56	8.99	10.25	10.26	1.022	.973	.854	.852
770	9.45	9.95	9.70	10.50	13.78	11.92	1.026	.948	.722	.835
771	9.57	9.93	9.70	10.50	13.77	11.91	1.024	.946	.721	.834
772	6.60	7.07	6.52	7.00	7.64	8.57	1.084	1.009	.926	.825
773	6.68	6.99	6.58	7.03	7.78	8.71	1.062	.994	.899	.802
774	12.05	12.30	10.53	12.54	20.27	15.44	1.168	.981	.607	.797
775	12.40	14.45	10.85	12.20	18.78	17.19	1.332	1.185	.769	.841
776	11.45	14.65	9.55	9.63	19.35	18.94	1.534	1.521	.757	.774
777	15.15	15.50	13.24	15.08	43.91	20.85	1.171	1.028	.353	.743
778	15.25	15.95	13.24	15.08	28.62	17.87	1.205	1.058	.557	.893
779	14.95	16.60	11.68	12.30	34.29	22.60	1.421	1.350	.484	.735
780	15.00	16.75	11.68	12.30	19.00	19.62	1.434	1.362	.882	.854
781	43.00	46.00	42.92	44.70	99.66	53.12	1.072	1.029	.462	.866
782	37.90	38.80	35.38	39.89	56.27	43.29	1.097	.973	.690	.896
783	40.00	41.50	40.61	41.95	63.07	43.93	1.022	.989	.658	.945
784	44.00	45.20	41.62	46.13	69.33	47.60	1.086	.980	.652	.950
785	43.10	44.10	41.62	46.13	158.90	60.91	1.060	.956	.278	.724
786	8.75	9.80	7.95	7.82	10.05	11.91	1.233	1.253	.975	.823
787	12.60	14.30	11.28	11.55	21.96	16.42	1.268	1.238	.651	.871
788	16.00	16.00	16.43	17.38	26.94	18.17	.974	.921	.594	.881
789	0.00	6.95	5.96	5.87	9.43	10.21	1.166	1.184	.737	.681
790	9.60	10.05	8.46	8.66	11.78	11.93	1.188	1.160	.853	.842
791	12.60	12.75	12.32	13.03	21.03	15.03	1.035	.978	.606	.849

EADY.

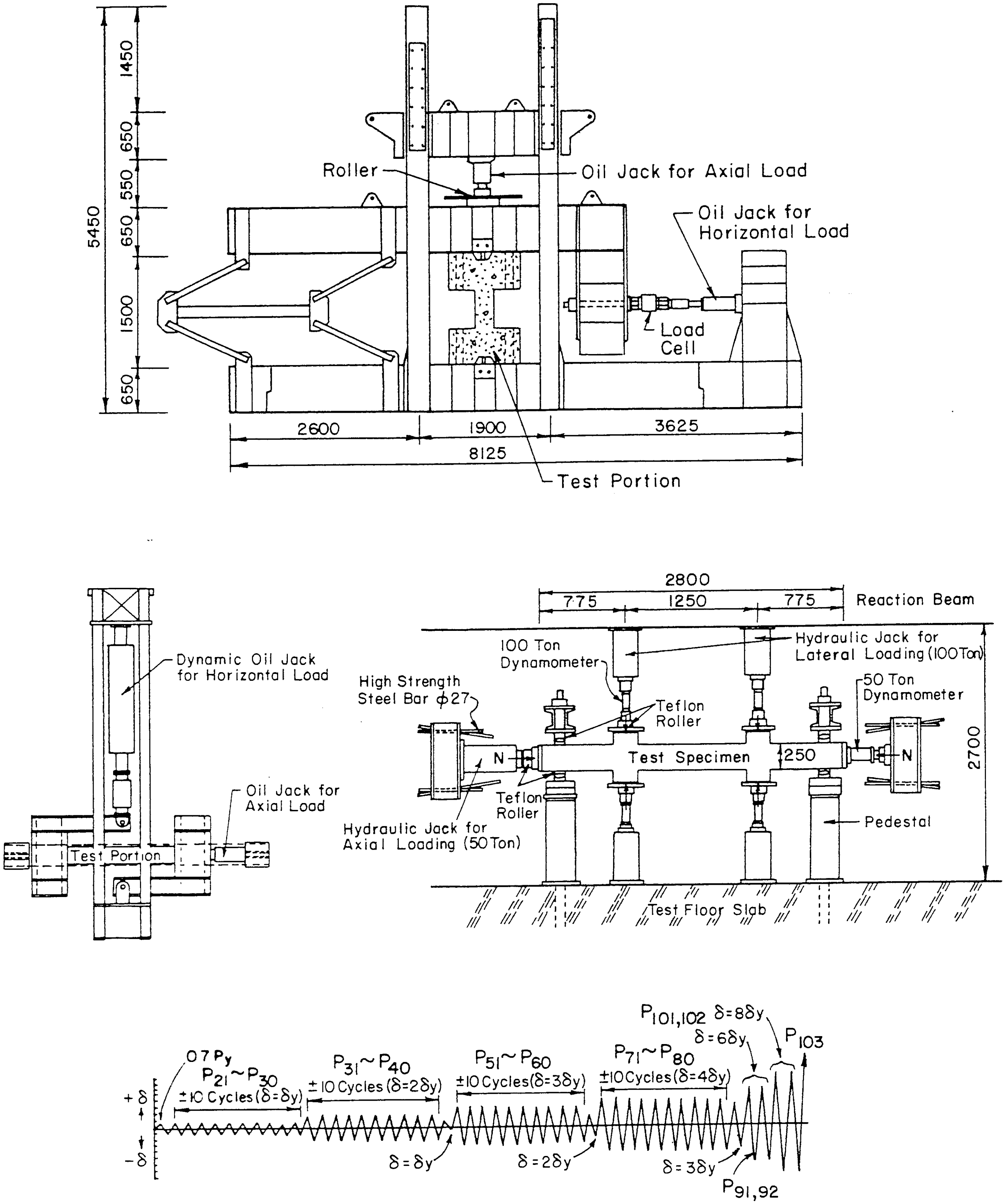


Fig. A1. Loading Methods Used for the Ministry of Construction Project

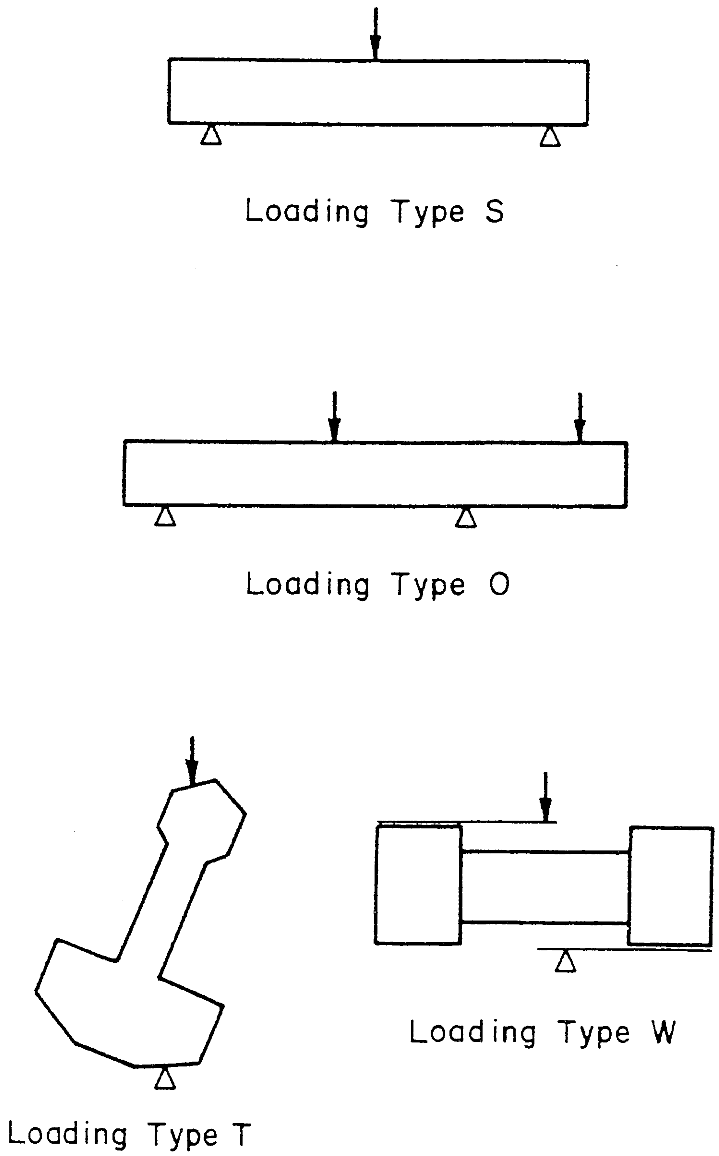
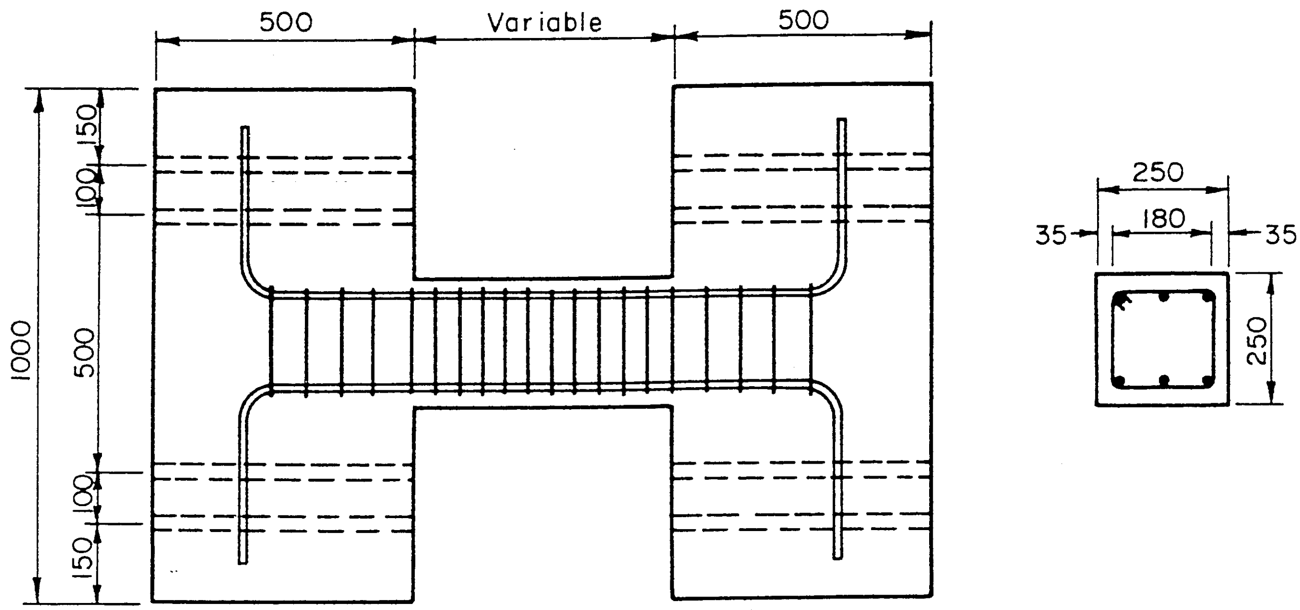
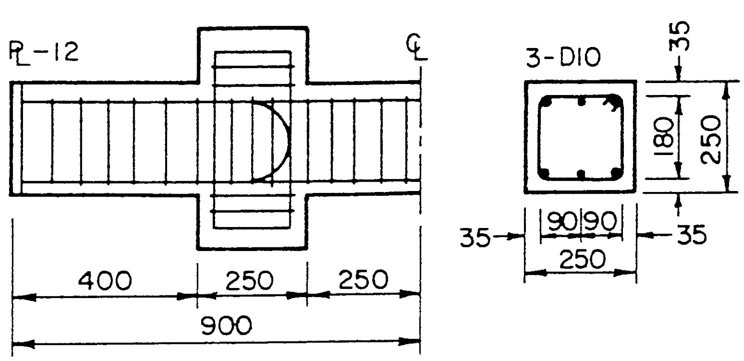


Fig. A2. Loading Methods Used for Various Tests Collected by Hirosawa



(a)



(b)

Fig. A3. Representative Specimens for the Ministry of Construction Research

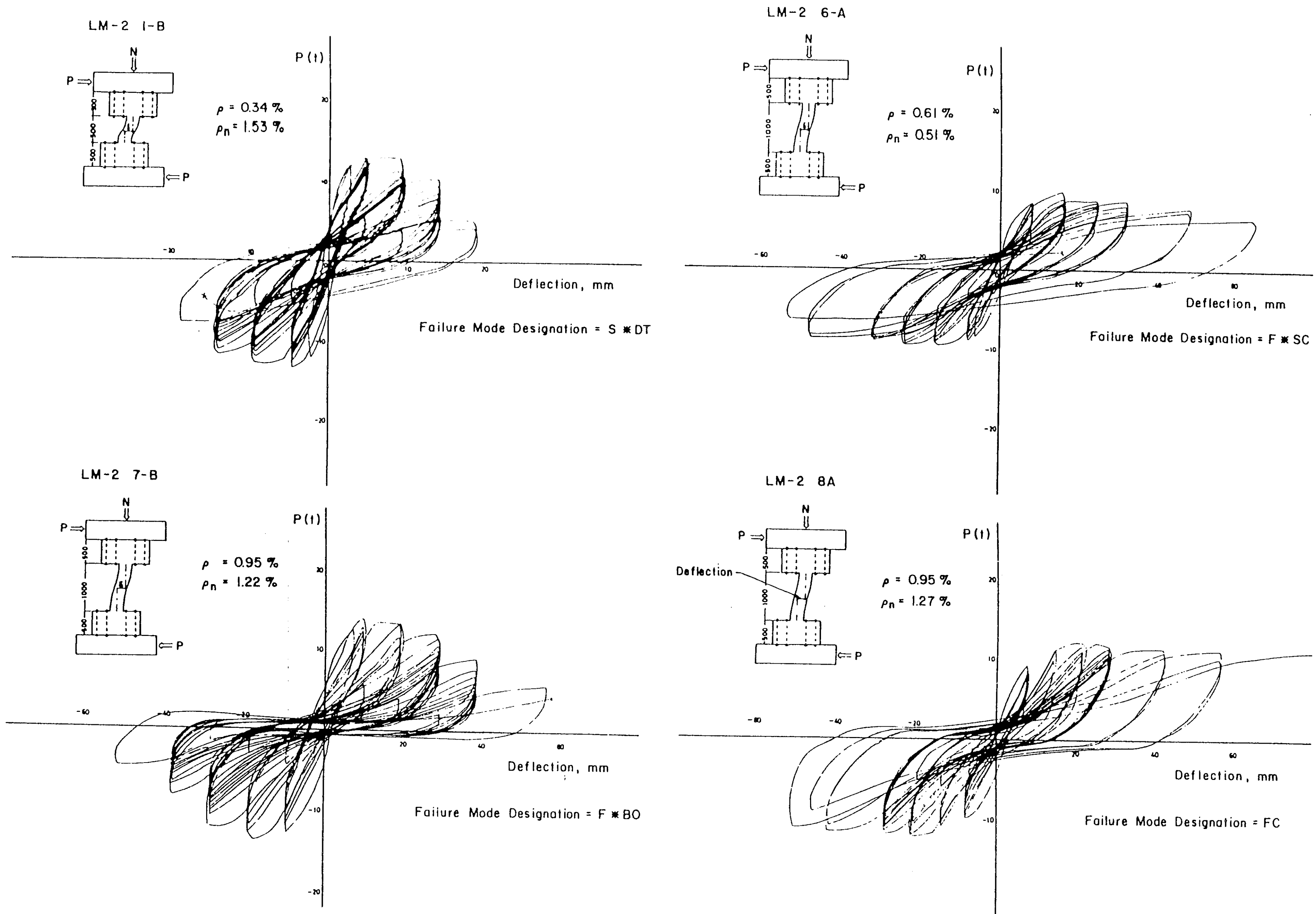


Fig. A4. Representative Load-Deflection Relationships Obtained During the Ministry of Construction Research Project

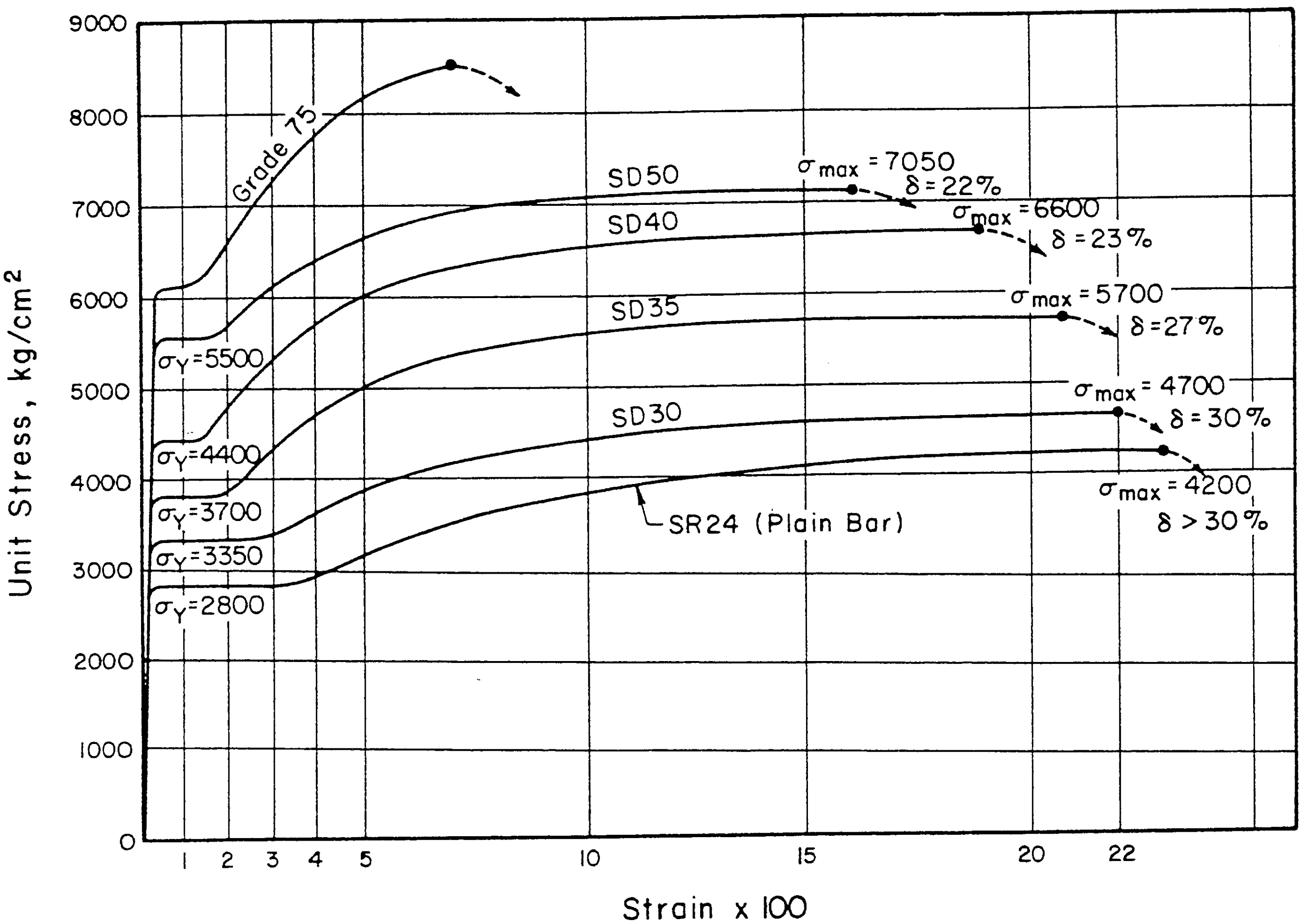


Fig. A5. Typical Stress-Strain Relationships of Various Type of Reinforcements Used in Japan

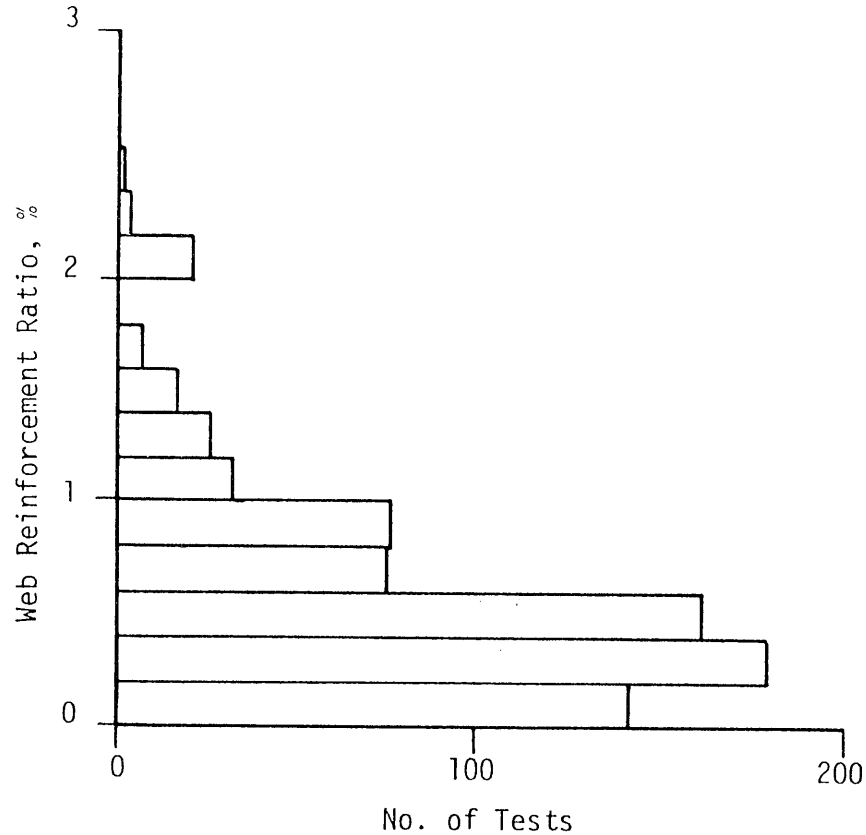


Fig. A6. Distribution of Web Reinforcement for the Total Population of Data Ratios

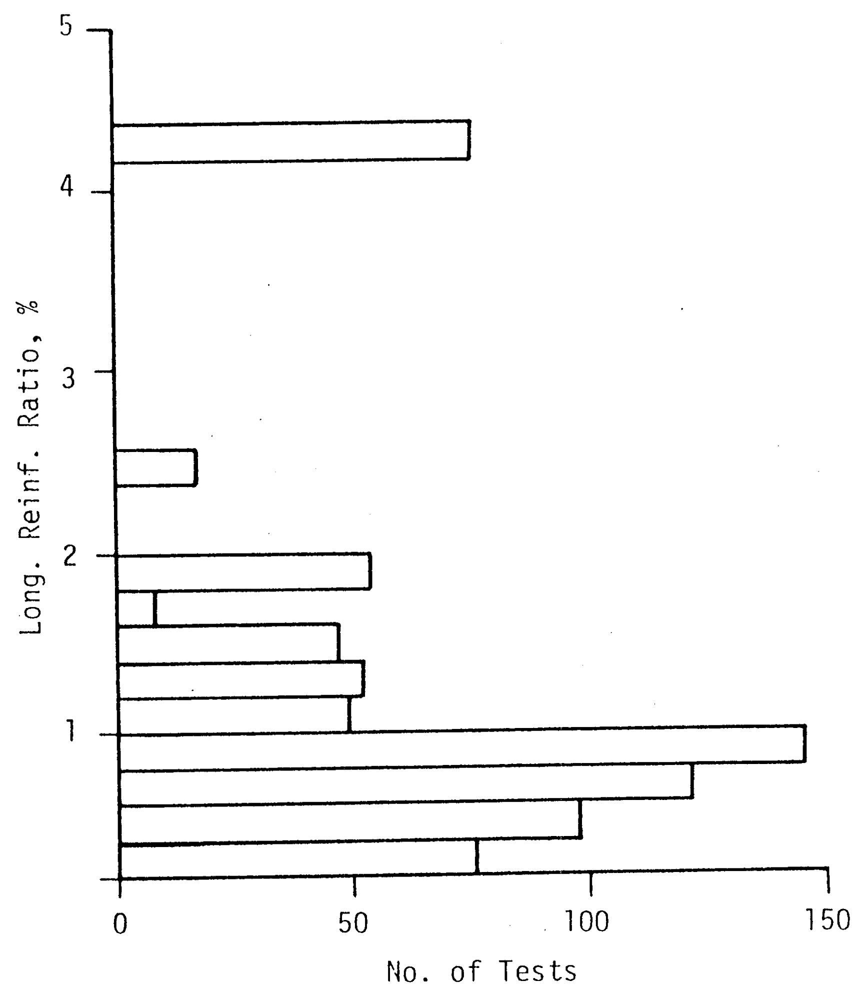


Fig. A7. Distribution of Longitudinal Reinforcement Ratios for the Total Population of Data

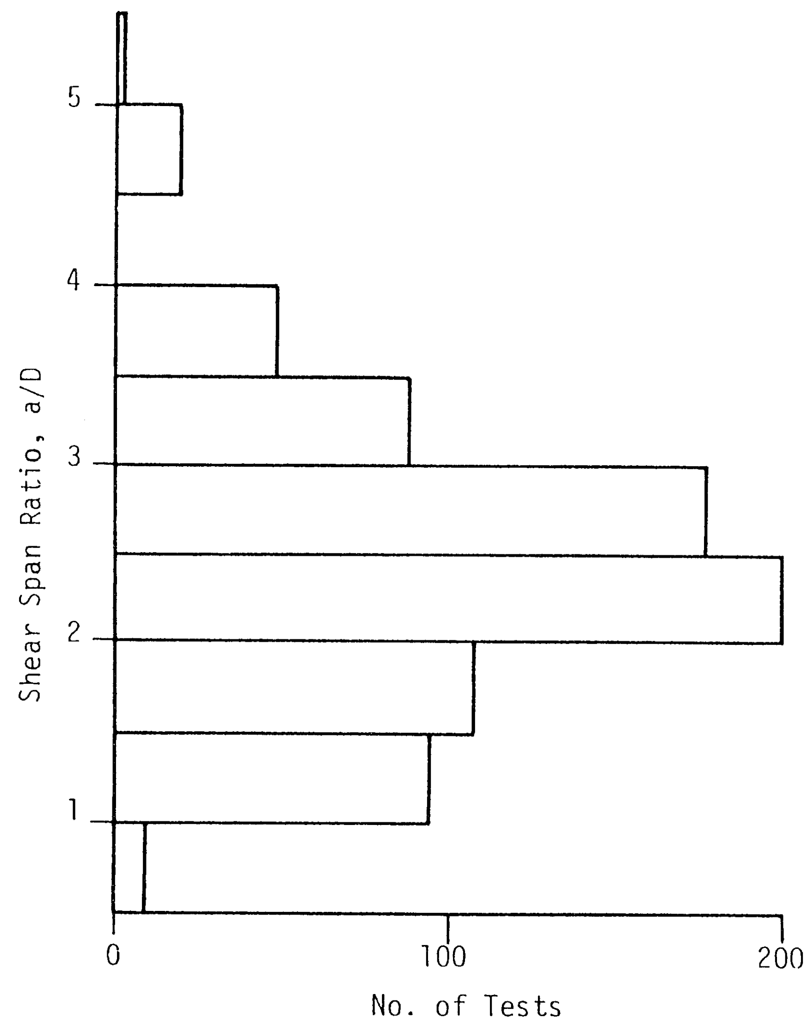


Fig. A8. Distribution of Shear Span Ratios for the Total Population of Data

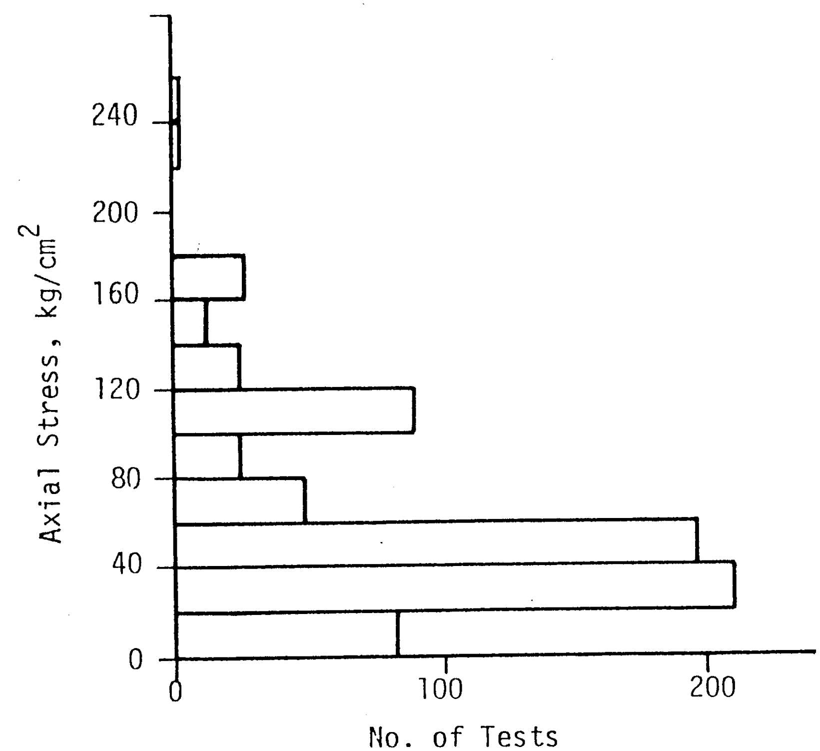


Fig. A9. Distribution of Axial Stress for the Total Population of Data

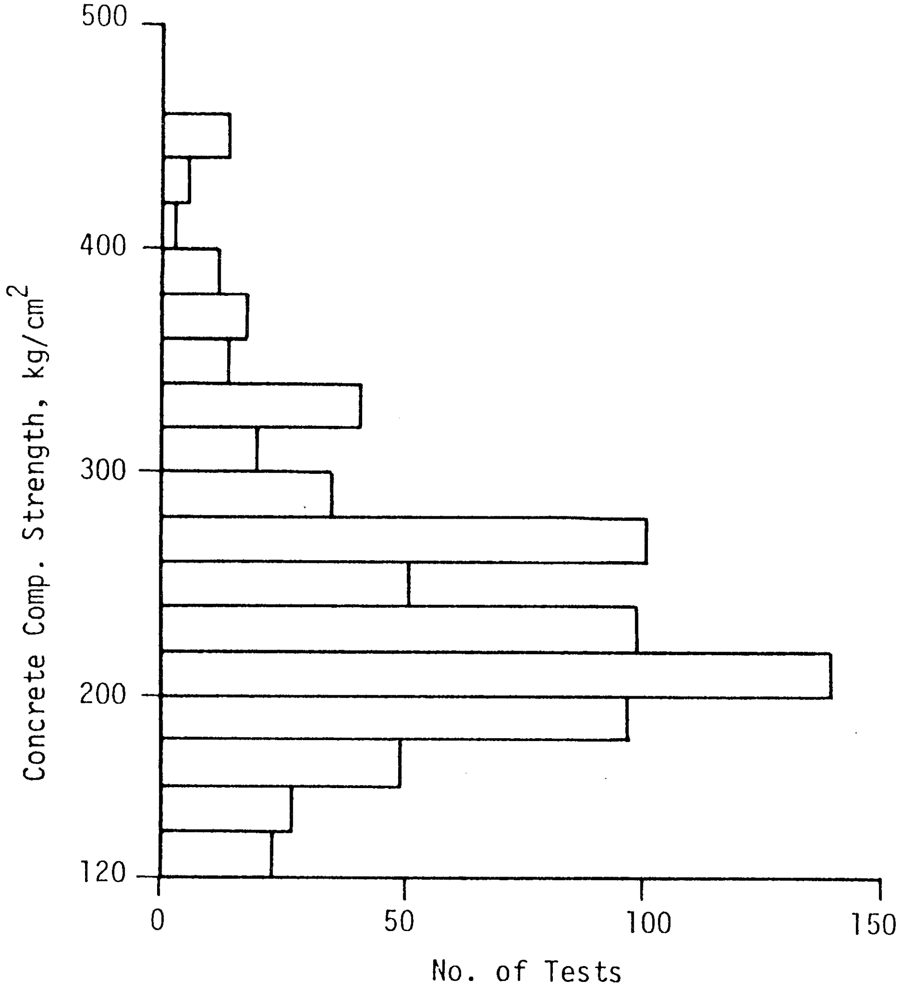


Fig. A10. Distribution of Compressive Strength of Concrete for Total Data Population

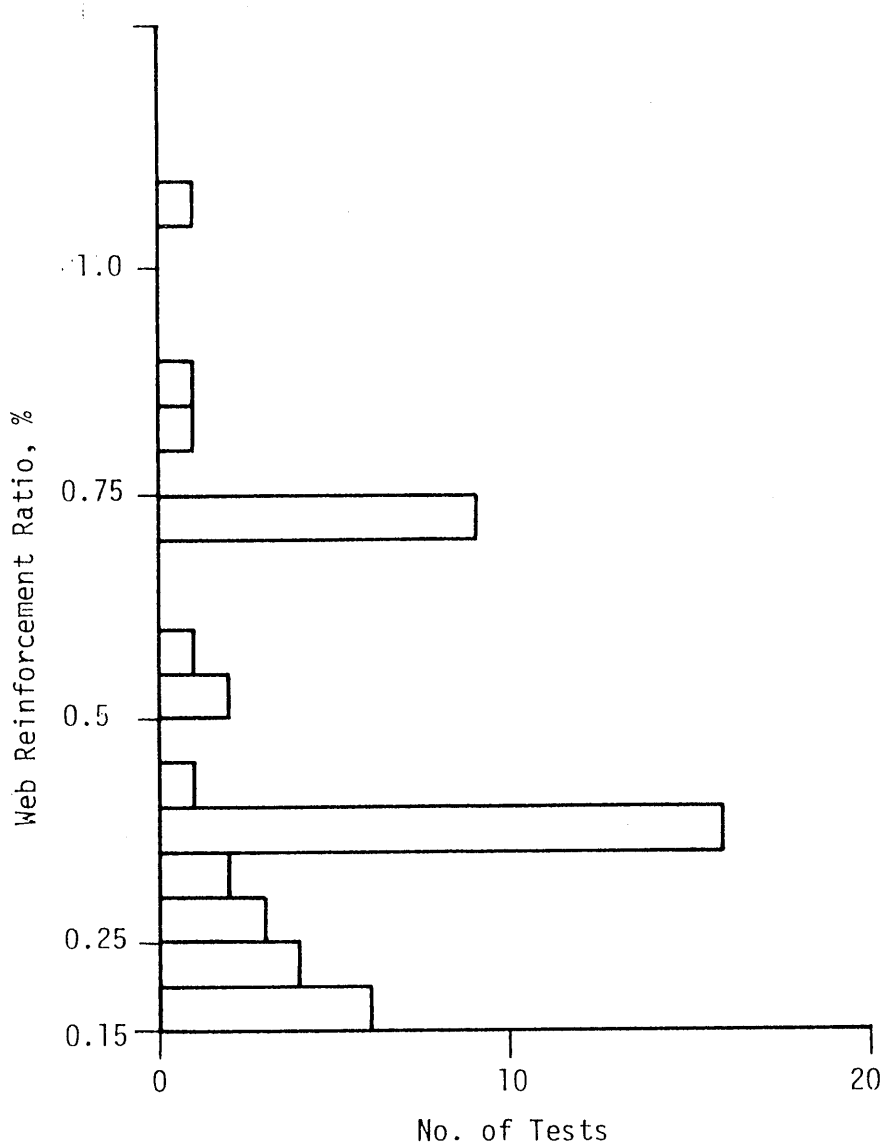


Fig. A11. Distribution of Web Reinforcement Ratios in Data Population for Calculation of Variability of the AIJ Expression for Shear Strength

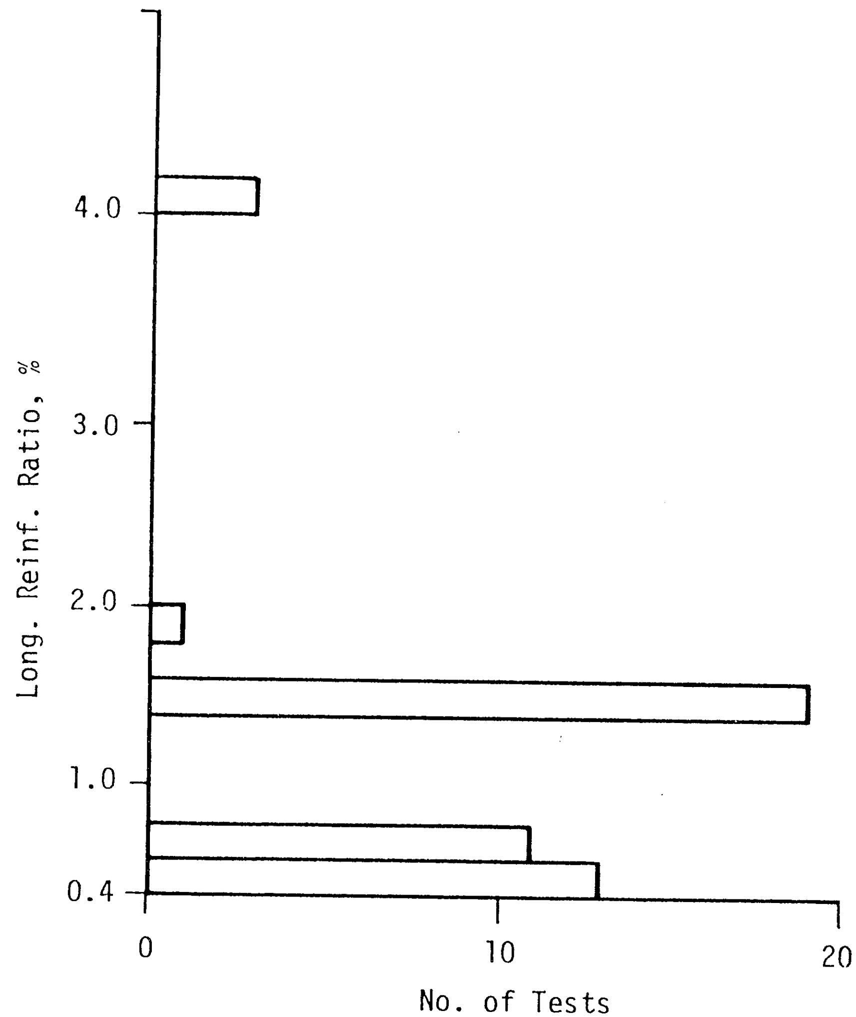


Fig. A12. Distribution of Longitudinal Reinforcement Ratios in Data Population for Calculation of Variability of AIJ Expression for Shear Strength

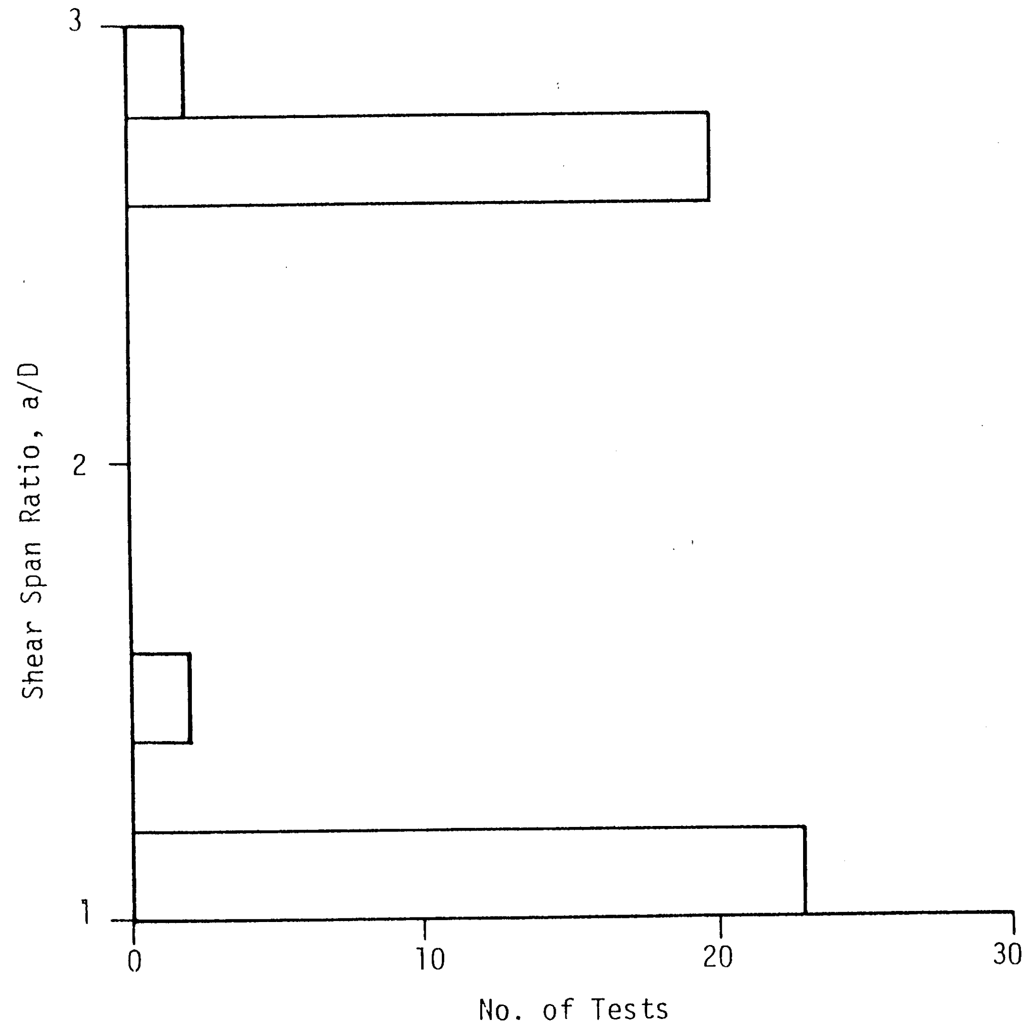


Fig. A13. Distribution of Shear-Span Ratios in Data Population for Calculation of Variability of AIJ Expression for Strength

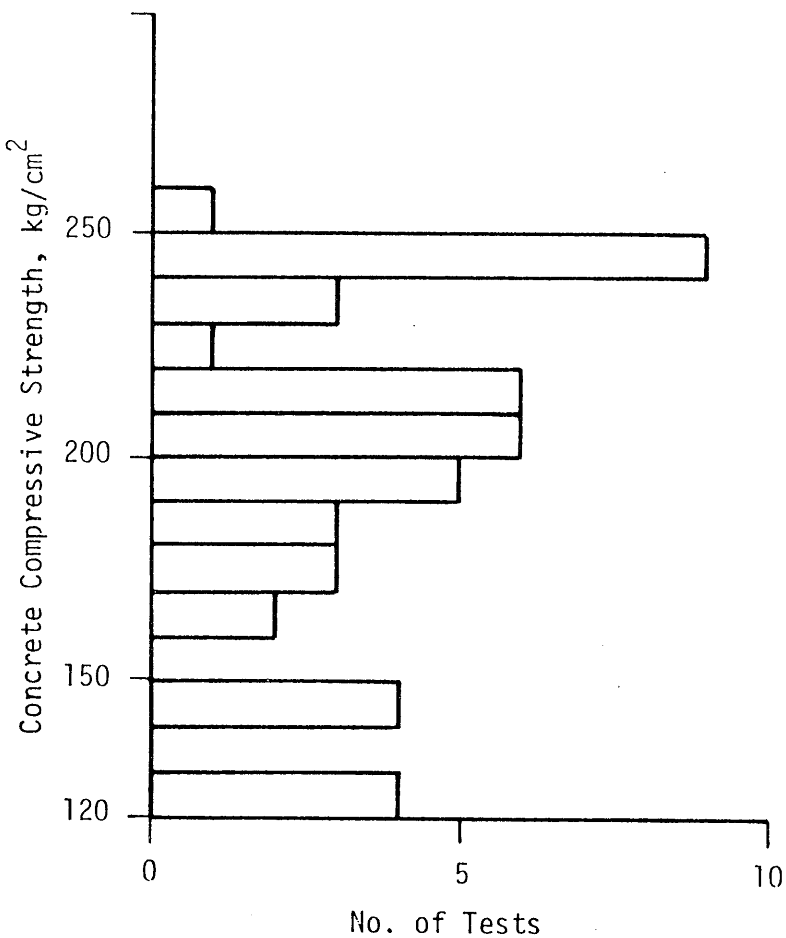


Fig. A14. Distribution of Axial Stress in Data Population for Calculation of Variability of AIJ Shear Equation

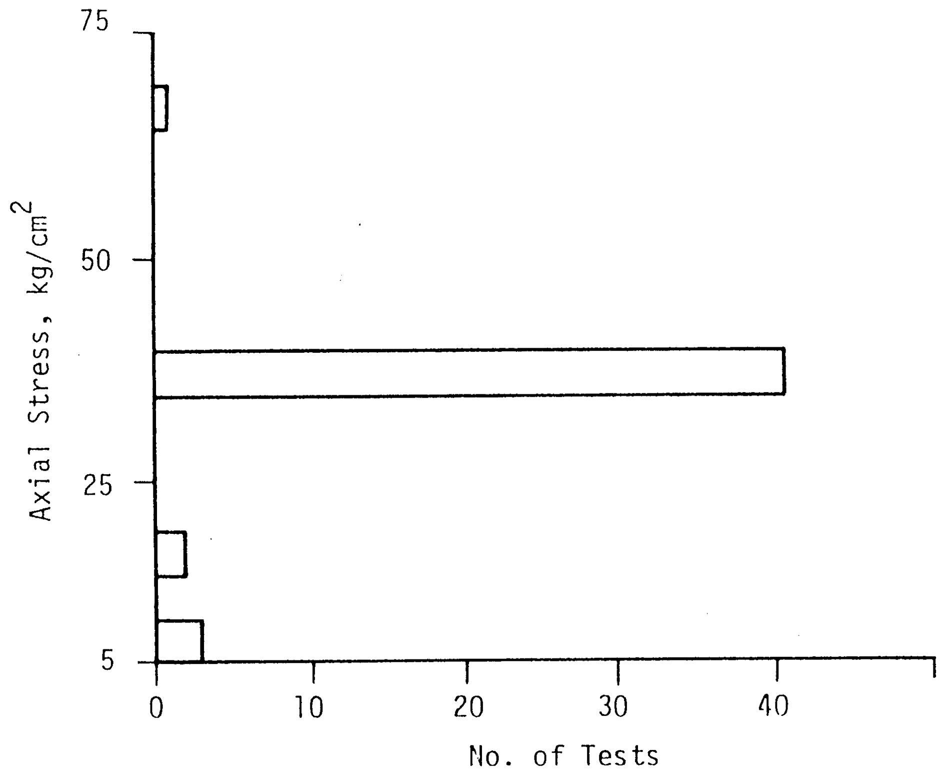


Fig. A15. Distribution of Compressive Strength of Concrete in Data Population for Calculation of Variability of AIJ Shear Equation

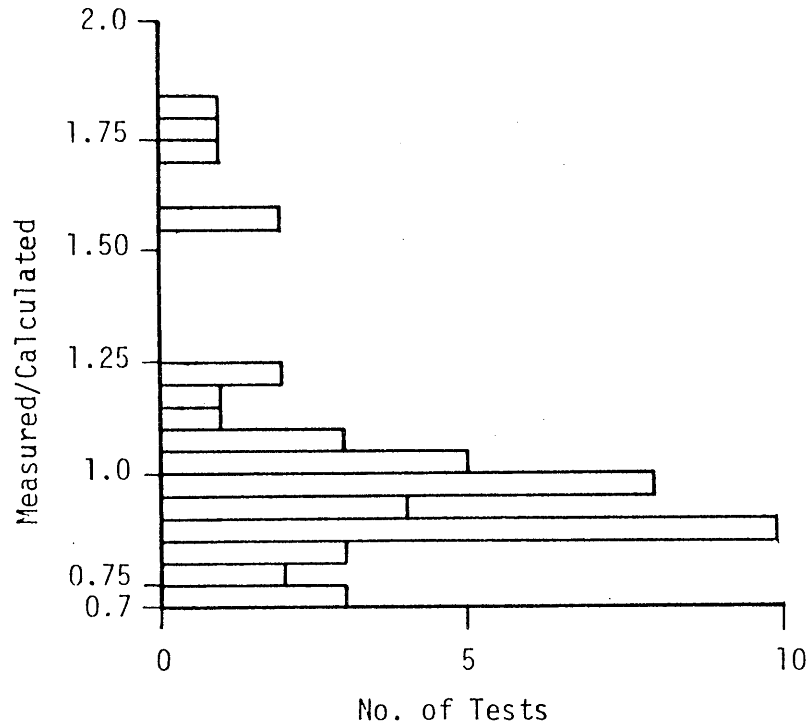


Fig. A16. Distribution of Ratios of Measured and Calculated Values, AIJ Expression for Shear Strength

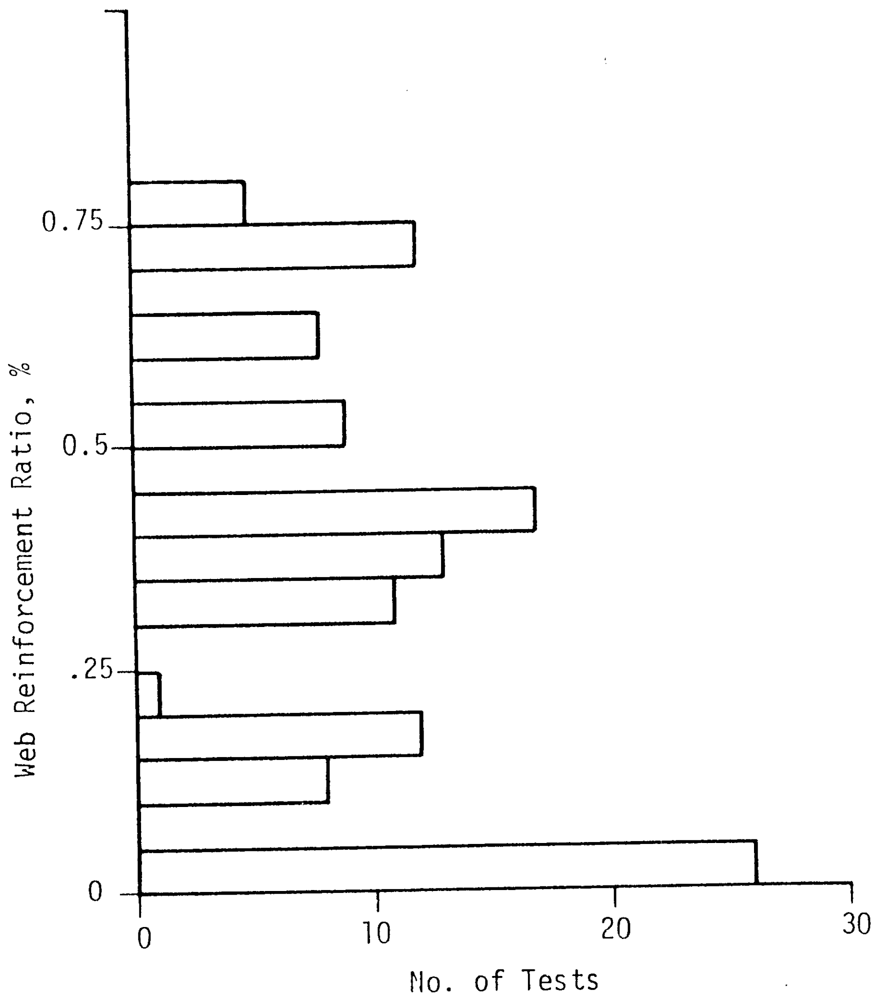


Fig. A17. Distribution of Web Reinforcement Ratios in the Data Population for Calculation of Variability of ACI Expression for Shear Strength

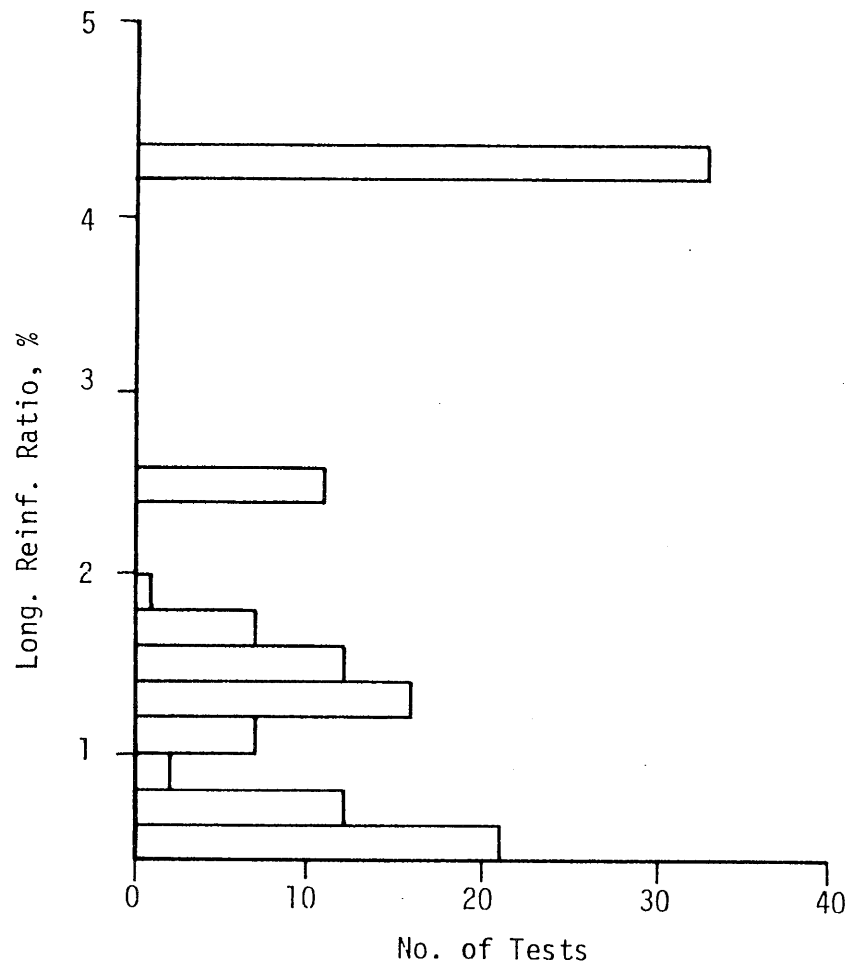


Fig. A18. Distribution of Longitudinal Reinforcement Ratios in Data Population for Calculation of Variability of ACI Expression for Shear Strength

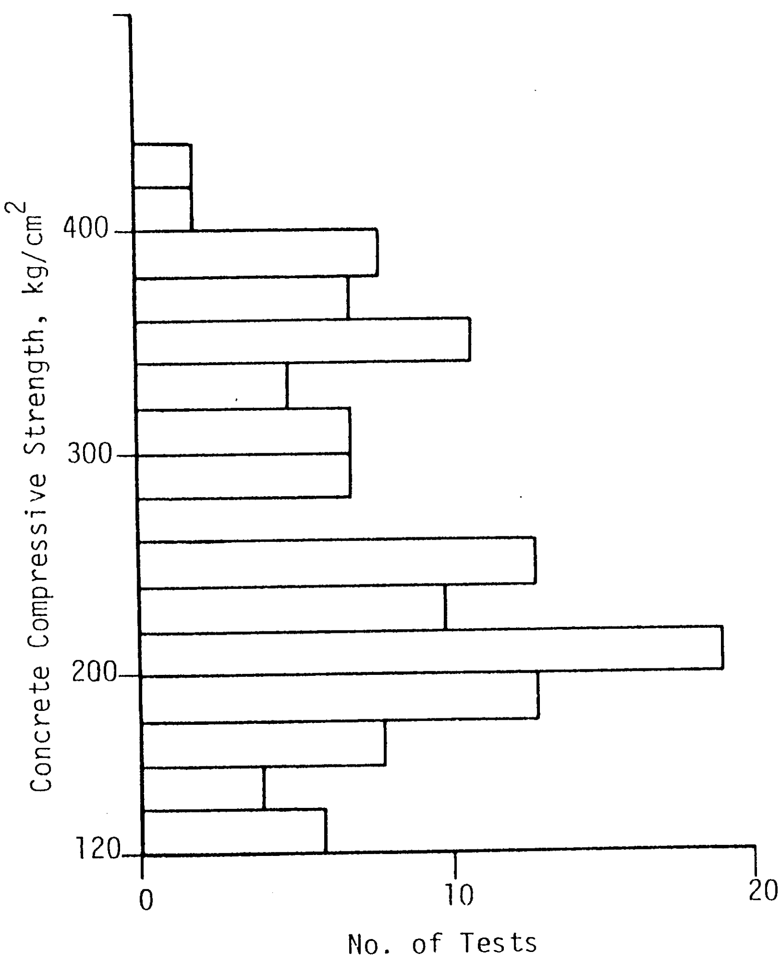


Fig. A19. Distribution of Shear-Span Ratios in Data Population for Calculation of Variability of ACI Expression for Shear Strength

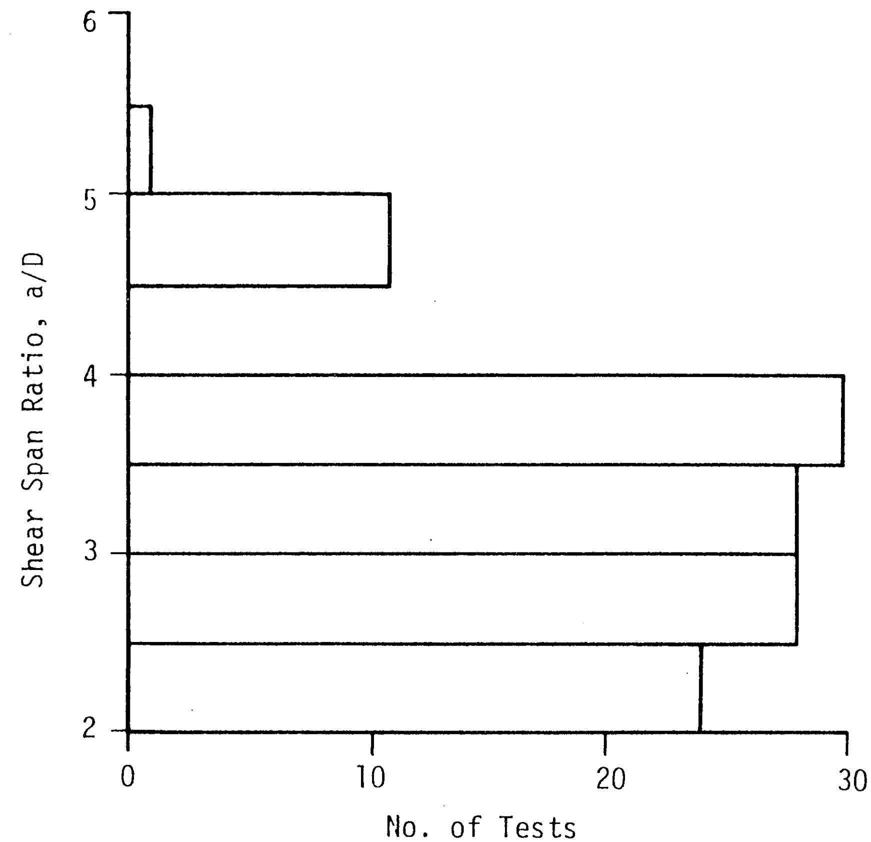


Fig. A20. Distribution of Axial Stress in Data Population for Calculation of Variability of ACI Expression for Shear Strength

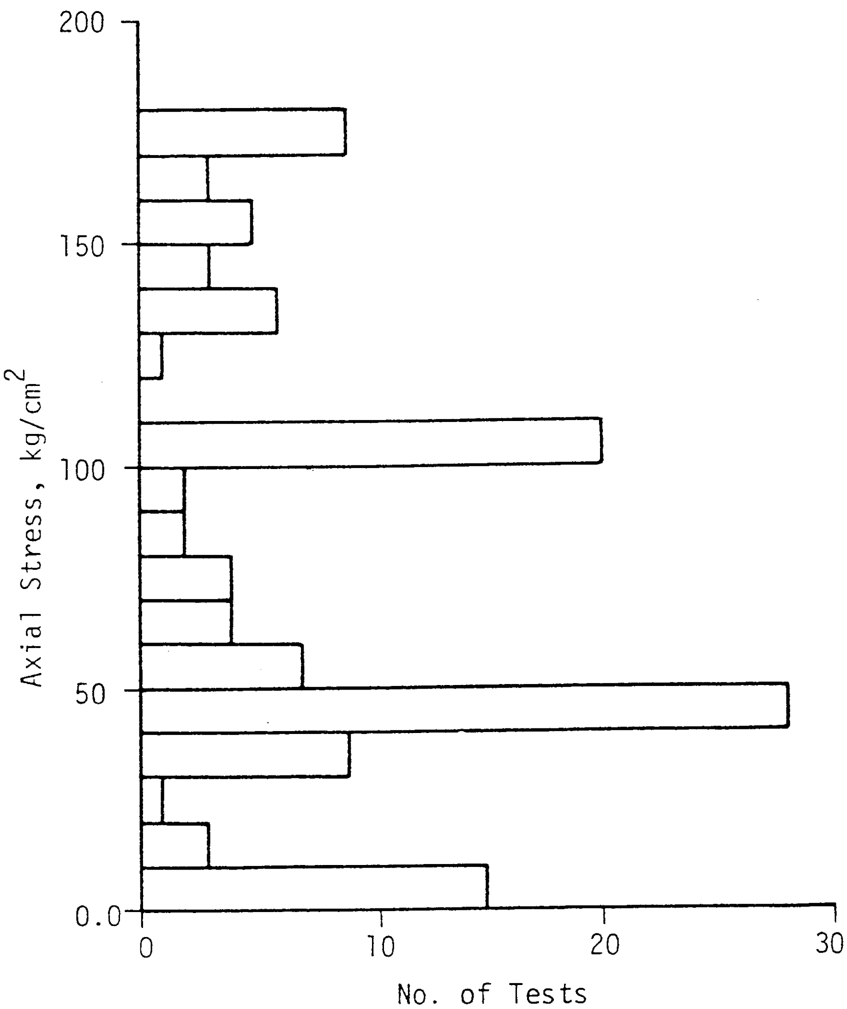


Fig. A21. Distribution of Compressive Strength of Concrete in Data Population for Calculation of Variability of ACI Expression for Shear Strength

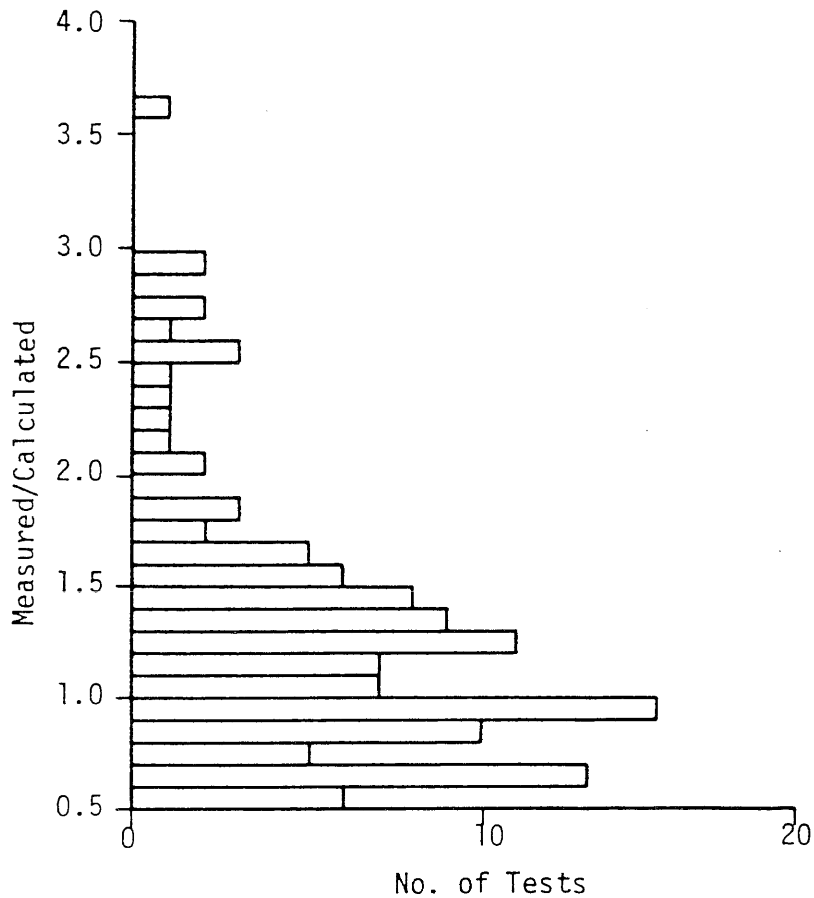


Fig. A22. Distribution of Ratios of Measured and Calculated Values, ACI Expression for Shear Strength

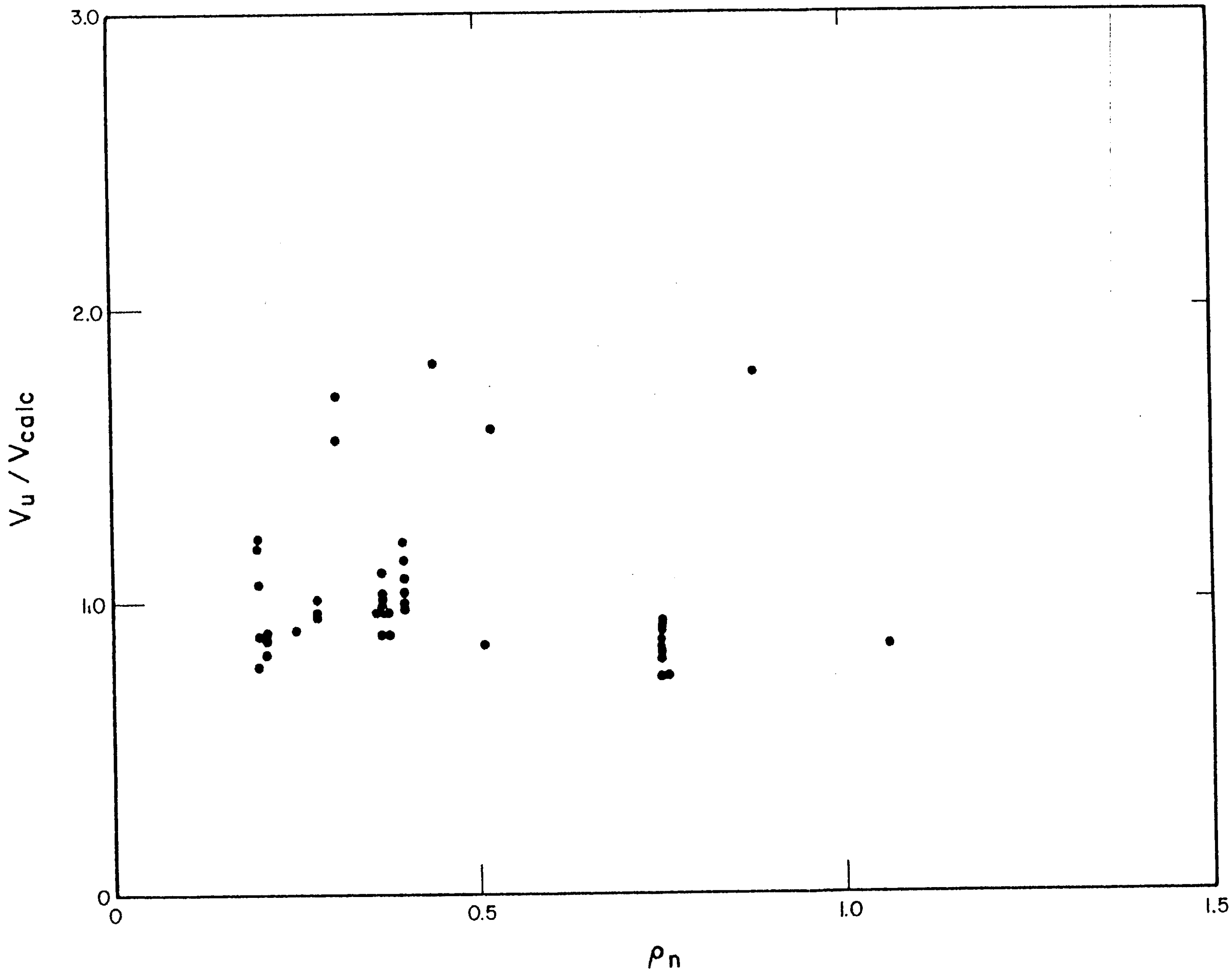


Fig. A.23 Ratios of Measured to Calculated Shear Strength (AIJ) at Different Web Reinforcement Ratios

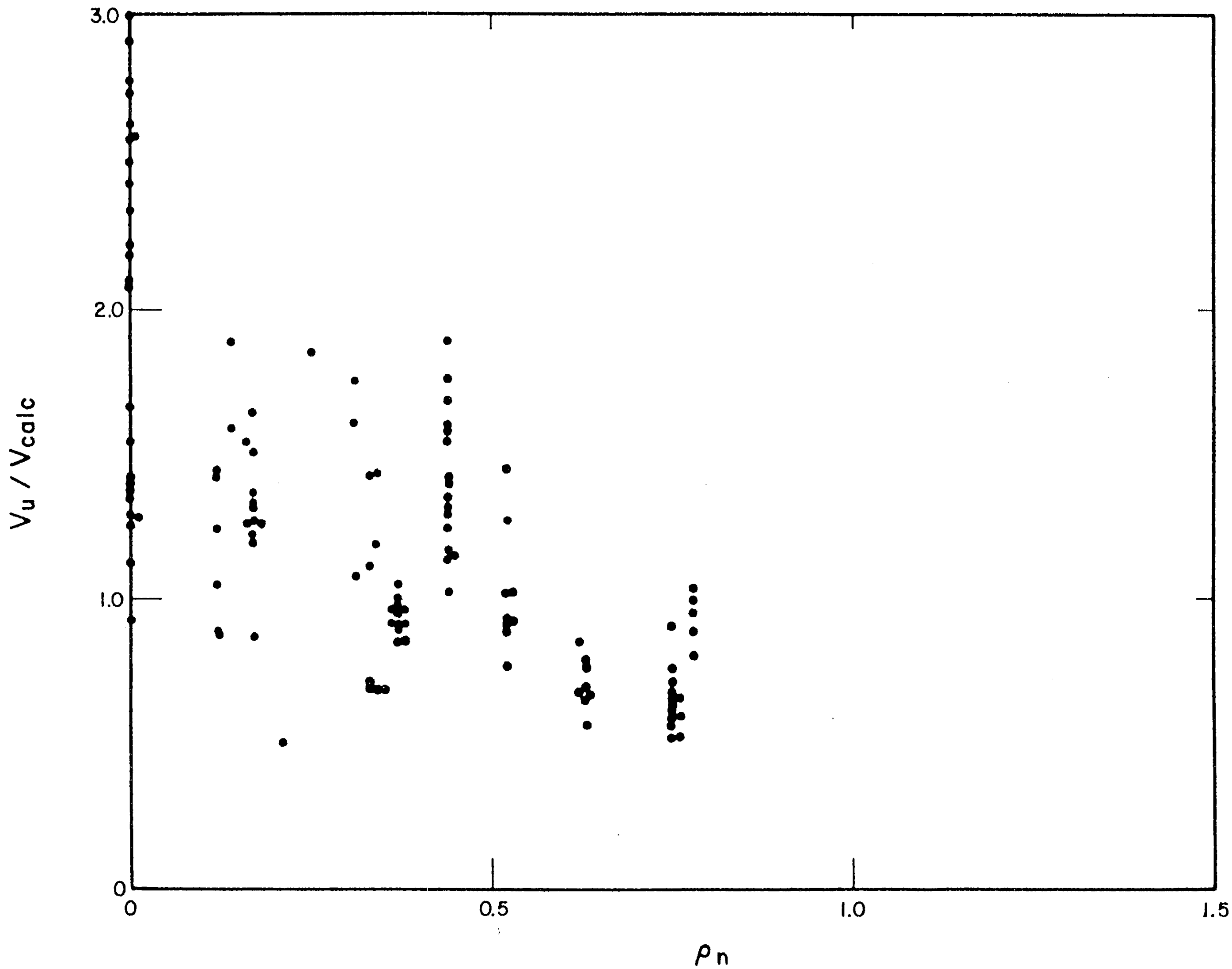


Fig. A.24 Ratios of Measured to Calculated Shear Strength (ACI) at Different Web Reinforcement Ratios

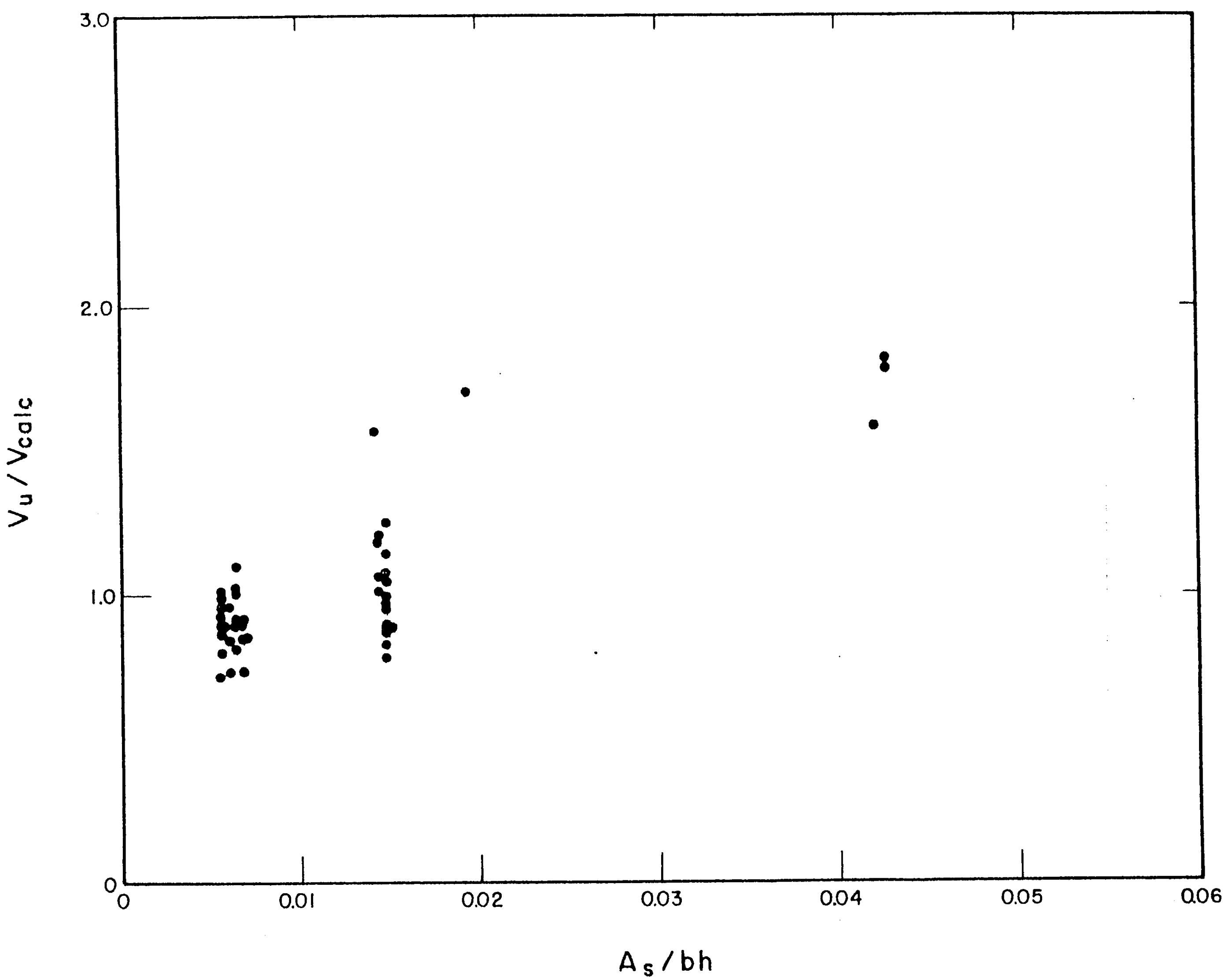


Fig. A.25 Ratios of Measured to Calculated Shear Strength (AIJ) at Different Longitudinal Reinforcement Ratios

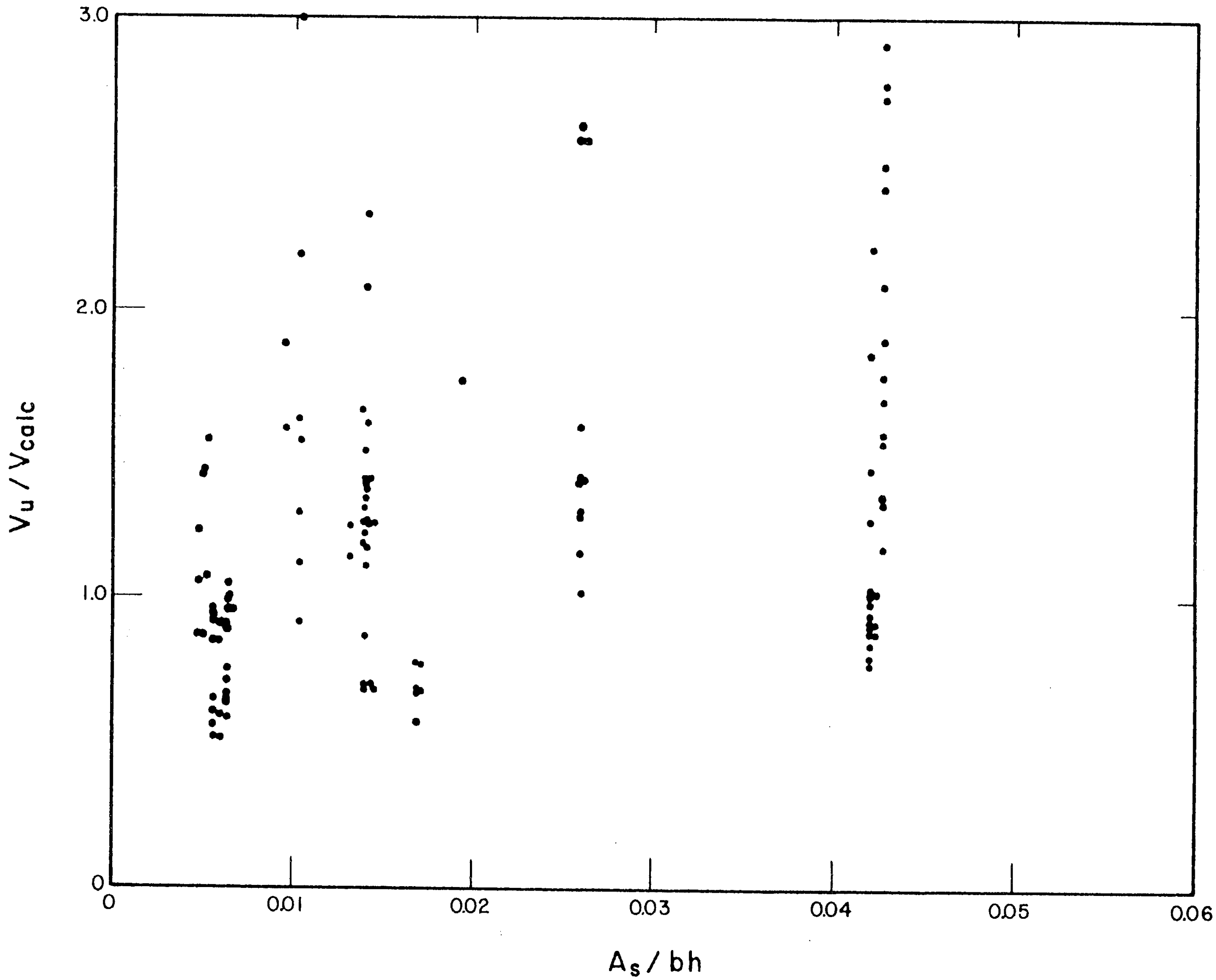


Fig. A.26 Ratios of Measured to Calculated Shear Strength (ACI) at Different Longitudinal Reinforcement Ratios

APPENDIX B

EXPRESSIONS FOR PARTIAL DERIVATIVES

1. AIJ Equations

The equations for the mean value of shears corresponding to flexural and shear strength are:

$$\mu(V_{uf}) = \nu(g_f)\{0.8\ a_t\ \mu(\sigma_y)\ \mu(D) + 0.5N\ \mu(D)[1 - \frac{N}{\mu(b)\mu(D)\mu(F_c)})\}\ /\ (\frac{\ell}{z})$$

$$\mu(V_{us}) = \nu(g_s)\left\{\frac{0.153\ (\frac{a_t}{\mu(b)\mu(D)})^{0.23}(180 + \mu(F_c))}{\frac{\ell/2}{\mu(D) - \mu(d_t)} + 0.12} + 2.7\sqrt{\frac{a_w}{\mu(b)\mu(s)}\ \mu(\sigma_y)} + 0.1 \times \frac{N}{\mu(b)\ \mu(D)}\right\} \times 0.8\ \mu(b)\ \mu(D)$$

The partial derivatives are given below for the equation for flexural strength.

$$(\frac{\partial V_{uf}}{\partial \sigma_y})_\mu \mu(\sigma_y) = \{0.8\ a_t\ \mu(\sigma_y)\ \mu(D)\}\ /(\frac{\ell}{2})$$

$$(\frac{\partial V_{uf}}{\partial D})_\mu\ \mu(D) = \{0.8\ a_t\ \mu(\sigma_y)\ \mu(D) + 0.5N\ \mu(D)\}\ /(\frac{\ell}{2})$$

$$(\frac{\partial V_{uf}}{\partial b})_\mu\ \mu(b) = \{\frac{0.5N^2}{\mu(b)\mu(F_c)}\}\ /(\frac{\ell}{2})$$

$$(\frac{\partial V_{uf}}{\partial F_c})_\mu\ \mu(F_c) = \{\frac{0.5N^2}{\mu(b)\mu(F_c)}\}\ /(\frac{\ell}{2})$$

Partial derivatives for shear strength:

$$\left(\frac{\partial V_{us}}{\partial b}\right)_{\mu} \mu(b) = \left\{ \frac{0.77\times 0.153\left(\frac{a_t}{\mu(b)\mu(D)}\right)^{0.23}(180+\mu(F_c))}{\frac{\ell/2}{\mu(D)-\mu(d_t)} + 0.12} \right.$$

$$\left. + 0.5\times 2.7\sqrt{\frac{a_w}{\mu(b)\mu(s)}\,\mu(\sigma_y)} \right\} 0.8\ \mu(b)\ \mu(D)$$

$$\left(\frac{\partial V_{us}}{\partial D}\right)_{\mu} \mu(D) = \left\{ 0.153\left(\frac{a_t}{\mu(b)\mu(D)}\right)^{0.23}(180+\mu(F_c)) \right.$$

$$\times \frac{0.77\left(\frac{\ell/2}{\mu(D)-\mu(d_t)} + 0.12\right) + \frac{\ell/2\ \mu(D)}{(\mu(D)-\mu(d_t))^2}}{\left(\frac{\ell/2}{\mu(D)-\mu(d_t)} + 0.12\right)^2}$$

$$\left. + 2.7\sqrt{\frac{a_w}{\mu(b)\mu(s)}\mu(\sigma_y)} \right\} \times 0.8\ \mu(b)\ \mu(D)$$

$$\left(\frac{\partial V_{us}}{\partial F_c}\right)_{\mu} \mu(F_c) = \frac{0.153\left(\frac{a_t}{\mu(b)\mu(D)}\right)^{0.23}\mu(F_c)}{\frac{\ell/2}{\mu(D)-\mu(d_t)} + 0.12}$$

$$\left(\frac{\partial V_{us}}{\partial d_t}\right)_{\mu} \mu(d_t) = -0.153\left(\frac{a_t}{\mu(b)\mu(D)}\right)^{0.23}(180+\mu(F_c))$$

$$\times \frac{\frac{\ell/2}{(\mu(D)-\mu(d_t))^2}}{\left(\frac{\ell/2}{\mu(D)-\mu(d_t)} + 0.12\right)^2} \times 0.8\ \mu(b)\ \mu(D)\ \ \mu(d_t)$$

$$\left(\frac{\partial V_{us}}{\partial \sigma_y}\right)_{\mu} \mu(\sigma_y) = 0.8\ \mu(b)\ \mu(D) \times \frac{1}{2}\ 2.7 \sqrt{\frac{a_w}{\mu(b)\mu(s)}\ \mu(\sigma_y)}$$

$$\left(\frac{\partial V_{us}}{\partial}\right)_{\mu} \mu(s) = -0.8\ \mu(b)\ \mu(D) \times \frac{1}{2}\ 2.7 \sqrt{\frac{a_w}{\mu(b)\mu(s)}\ \mu(\sigma_y)}$$

2. ACI Equations

The equations for the mean value of shear corresponding to flexural and shear strength are:

$$\mu(V_{uf}) = \nu(g_f) \Bigg[(N + A_s\ \mu(f_y) - A_s'\ \mu(f_s') \Bigg\{ 1 - \mu(n)$$

$$\times \frac{N + A_s\ \mu(f_y) - A_s'\ \mu(f_s')}{\mu(f_c')\ \mu(b)\ (\mu(h) - \mu(d'))} \Bigg\} (\mu(h) - \mu(d'))$$

$$+ A_s'\ \mu(f_s')\ (\mu(h) - 2\mu(d')) - N\ \left(\frac{\mu(h) - 2\mu(d')}{2}\right) \Bigg] / \left(\frac{\ell}{2}\right)$$

where

$$\mu(f_s') = (\mu(C_1) - \sqrt{\mu^2(C_1) + \mu(C_2)}\ )\ \mu(E_s)$$

$$\mu(C_1) = \frac{1}{2} \left\{ \frac{N}{A_s'\ \mu(E_s)} + \frac{A_s\ \mu(f_y)}{A_s'\ \mu(E_s)} + \mu(\varepsilon_{cu}) \right\}$$

$$\mu(C_2) = \Bigg\{ \mu(k_1 k_3)\ \mu(f_c')\ \mu(b)\ \mu(d') - N - A_s \mu(f_y) \Bigg\}$$

$$\times \frac{\mu(\varepsilon_{cu})}{A_s'\ \mu(E_s)}$$

$$\mu(V_{us}) = \nu(g_s) \left[\left\{ 0.5 \sqrt{\mu(f'_c)} + 176 \frac{A_s}{\mu(b)(\mu(h) - \mu(d'))} \right.\right.$$

$$\left. \times \frac{1}{\frac{\ell/2}{\mu(h) - \mu(d')} - \frac{N}{\mu(V_{uf})} \left(\frac{3\mu(h) + \mu(d')}{8(\mu(h) - \mu(d'))}\right)} \right\} \mu(b)\ (\mu(h) - \mu(d')$$

$$\left. + A_v\, \mu(f_y)\, \frac{\mu(h) - \mu(d')}{\mu(s)} \right]$$

The partial derivatives are given below for the equation for flexural strength.

$$f'_s = \frac{1}{2A'_s} (N + A_s f_y + \varepsilon_{cu} A'_s E_s)$$

$$- \left[\left\{ \frac{1}{2A'_s} (N + A_s f_y + \varepsilon_{cu} A'_s E_s) \right\}^2 + \frac{\varepsilon_{cu} E_s}{A'_s} (k_1 k_3 f'_c bd' - N - A_s f_y) \right]^{1/2}$$

$$\frac{\partial f'_s}{\partial f_y} = \frac{A_s}{2A'_s} - \frac{1}{2} \left[\left\{ \frac{1}{2A'_s} (N + A_s f_y + \varepsilon_{cu} A'_s E_s) \right\}^2 + \frac{\varepsilon_{cu} E_s}{A'_s} (k_1 k_3 f'_c bd' - N - A_s f_y) \right]^{-1/2}$$

$$\times \left\{ \frac{1}{A'_s} (N + A_s f_y + \varepsilon_{cu} A'_s E_s) \times \frac{A_s}{2A'_s} - \frac{A_s}{A'_s} \varepsilon_{cu} E_s \right\}$$

$$\frac{\partial f'_s}{\partial \varepsilon_{cu}} = \frac{E_s}{2} - \frac{1}{2} \left[\left\{ \frac{1}{2A'_s} (N + A_s f_y + \varepsilon_{cu} A'_s E_s) \right\}^2 + \frac{\varepsilon_{cu} E_s}{A'_s} (k_1 k_3 f'_c bd' - N - A_s f_y) \right]^{-1/2}$$

$$\times \left\{ \frac{1}{A'_s} (N + A_s f_y + \varepsilon_{cu} A'_s E_s) \times \frac{E_s}{2} + \frac{E_s}{A'_s} (k_1 k_3 f'_c bd' - N - A_s f_y) \right\}$$

$$\frac{\partial f'_s}{\partial E_s} = \frac{\varepsilon_{cu}}{2} - \frac{1}{2} \left[\left\{ \frac{1}{2A'_s} (N + A_s f_y + \varepsilon_{cu} A'_s E_s) \right\}^2 + \frac{\varepsilon_{cu} E_s}{A'_s} (k_1 k_3 f'_c bd' - N - A_s f_y) \right]^{-1/2}$$

$$\times \left\{ \frac{1}{A'_s} (N + A_s f_y + \varepsilon_{cu} A'_s E_s) \times \frac{\varepsilon_{cu}}{2} + \frac{\varepsilon_{cu}}{A'_s} (k_1 k_3 f'_c bd' - N - A_s f_y) \right\}$$

$$\frac{\partial f'_s}{\partial(k_1k_3)} = -\frac{1}{2}\left[\left\{\frac{1}{2A'_s}(N + A_sf_y + \varepsilon_{cu}A'_sE_s)\right\}^2 + \frac{\varepsilon_{cu}E_s}{A'_s}(k_1k_3f'_cbd'-N-A_sf_y)\right]^{-1/2}$$

$$\times \frac{\varepsilon_{cu}E_s}{A'_s} f'_cbd'$$

$$\frac{\partial f'_s}{\partial b} = -\frac{1}{2}\left[\left\{\frac{1}{2A'_s}(N + A_sf_y + \varepsilon_{cu}A'_sE_s)\right\}^2 + \frac{\varepsilon_{cu}E_s}{A'_s}(k_1k_3f'_cbd'-N-A_sf_y)\right]^{-1/2}$$

$$\times \frac{\varepsilon_{cu}E_s}{A'_s} k_1k_3f'_cd'$$

$$\frac{\partial f'_s}{\partial d'} = -\frac{1}{2}\left[\left\{\frac{1}{2A'_s}(N + A_sf_y + \varepsilon_{cu}A'_sE_s)\right\}^2 + \frac{\varepsilon_{cu}E_s}{A'_s}(k_1k_3f'_cbd'-N-A_sf_y)\right]^{-1/2}$$

$$\times \frac{\varepsilon_{cu}E_s}{A'_s} k_1k_3f'_cb$$

$$\frac{\partial f'_s}{\partial f'_c} = \frac{1}{2}\left[\left\{\frac{1}{2A'_s}(N+A_sf_y+\varepsilon_{cu}A'_sE_s)\right\}^2 + \frac{\varepsilon_{cu}E_s}{A'_s}(k_1k_3f'_cbd'-N-A_sf_y)\right]^{-1/2}$$

$$\times \frac{\varepsilon_{cu}E_s}{A'_s} k_1k_3bd'$$

$$V_{uf} = \left[(N + A_sf_y-A'_sf'_s)\left\{1 - \eta\frac{N + A_sf_y - A'_sf'_s}{f'_c\, b(h-d')}\right\}(h-d')\right.$$

$$\left. + A'_sf'_s(h-2d') - N\left(\frac{h-2d'}{2}\right)\right] / \left(\frac{\ell}{2}\right)$$

$$\frac{\partial V_{uf}}{\partial f_y} = \left[\left(A_s - A'_s\frac{\partial f'_s}{\partial f_y}\right)\left\{1 - \eta\frac{N + A_sf_y - A'_sf'_s}{f'_c\, b(h-d')}\right\}(h-d')\right.$$

$$\left. + (N + A_sf_y - A'_sf'_s)\frac{\eta\left(A_s-A'_s\frac{\partial f'_s}{\partial f_y}\right)}{f'_c\, b(h-d')}(h-d') + A'_s(h-2d')\frac{\partial f'_s}{\partial f_y}\right] / \left(\frac{\ell}{2}\right)$$

$$\frac{\partial V_{uf}}{\partial \varepsilon_{cu}} = \left[\left(-A_s' \frac{f_s'}{\partial \varepsilon_{cu}}\right) \left\{ 1 - n \frac{N + A_f f_y - A_s' f_s'}{f_c' \, b(h-d')} \right\} (h-d') \right.$$

$$+ (N + A_s f_y - A_s' f_s') \frac{n\left(-A_s' \frac{\partial f_s'}{\partial \varepsilon_{cu}}\right)}{f_c' \, b(h-d')} (h-d')$$

$$\left. + A_s' \, (h-2d') \frac{\partial f_s'}{\partial \varepsilon_{cu}} \right] / \left(\frac{\ell}{2}\right)$$

$$\frac{\partial V_{uf}}{\partial E_s} = \left[\left(-A_s' \frac{\partial f_s'}{\partial E_s}\right) \left\{ 1 - n \frac{N + A_s f_y - A_s' f_s}{f_c' \, b(h-d')} \right\} (h-d') \right.$$

$$\left. + (N + A_s f_y - A_s' f_s') \frac{n\left(-A_s' \frac{\partial f_s'}{\partial E_s}\right)}{f_c' \, (h-d')} (h-d') + A_s' \, (h-2d') \frac{\partial f_s'}{\partial E_s} \right] / \left(\frac{\ell}{2}\right)$$

$$\frac{\partial V_{uf}}{\partial (k_1 k_3)} = \left[\left(-A_s' \frac{\partial f_s'}{\partial (k_1 k_3)}\right) \left\{ 1 - n \frac{N + A_s f_y - A_s' f_s'}{f_c' \, b(h-d')} \right\} (h-d') \right.$$

$$+ (N + A_s f_y - A_s' f_s') \frac{n\left(-A_s' \frac{f_s'}{\partial (k_1 k_3)}\right)}{f_c' \, b(h-d')} \quad (h-d')$$

$$\left. + A_s' (h-2d') \frac{\partial f_s'}{\partial (k_1 k_3)} \right] / \left(\frac{\ell}{2}\right)$$

$$\frac{\partial V_{uf}}{\partial b} = \left[\left(-A_s' \frac{\partial f_s'}{\partial b}\right) \left\{ 1 - n \frac{N + A_s f_y - A_s' f_s'}{f_c' \, b(h-d')} \right\} (h-d') \right.$$

$$+ (N + A_s f_y - A_s' f_s') \left\{ - \frac{n}{f_c' (h-d')} \; \frac{\left[-A_s' \frac{\partial f_s'}{\partial b}\right] b - (N + A_s f_y - A_s' f_s')}{b^2} \right\} (h-d')$$

$$\left. + A_s' \, (h-2d') \frac{\partial f_s'}{\partial b} \right] / \left(\frac{\ell}{2}\right)$$

$$\frac{\partial V_{uf}}{\partial d'} = \left[\left(-A_s' \frac{\partial f_s'}{\partial d'}\right) \left\{ 1 - n \frac{N + A_s f_y - A_s' f_s'}{f_c' \, b(h-d')} \right\} (h-d') \right.$$

$$+ (N + A_s f_y - A_s' f_s') \left\{ -1 - \frac{n}{f_c' b} \left(-A_s' \frac{\partial f_s'}{\partial d'}\right) \right\}$$

$$\left. + A_s'(h-2d') \frac{\partial f_s'}{\partial d'} + A_s' f_s' \, (-2) + N \right] / \left(\frac{\ell}{2}\right)$$

$$\frac{\partial V_{uf}}{\partial f_c'} = \left[\left(-A_s' \frac{\partial f_s'}{\partial f_c'}\right) \left\{ 1 - n \frac{N + A_s f_y - A_s' f_s'}{f_c' \, b(h-d')} \right\} (h-d') \right.$$

$$+ (N + A_s f_y - A_s' f_s) \left\{ - \frac{n}{b(h-d')} \; \frac{\left(-A_s' \frac{\partial f_s'}{\partial f_c'}\right) f_c' - (N + A_s f_y - A_s' f_s')}{(f_c')^2} \right\} (h-d')$$

$$\left. + A_s'(h-2d') \frac{\partial f_s'}{\partial f_c'} \right] / \left(\frac{\ell}{2}\right)$$

$$\frac{\partial V_{uf}}{\partial h} = \left\{ (N + A_s f_y - A_s' f_s') + A_s' f_s' - \frac{N}{2} \right\} / \left(\frac{\ell}{2}\right)$$

$$\frac{V_{uf}}{\partial n} = \left\{ - \frac{(N + A_s f_y - A_s' f_s')^2}{f_c' \, b} \right\} / \left(\frac{\ell}{2}\right)$$

Partial derivatives for shear strength:

$$V_{us} = \left\{ 0.5 \sqrt{f'_c} + 176 \frac{A_s}{b(h-d')} \frac{1}{\frac{\ell/2}{h-d'} - \frac{N}{V_{uf}} \frac{3h+d'}{8(h-d')}} \right\} b(h-d')$$

$$+ A_v f_y \frac{h-d'}{S}$$

$$\frac{\partial V_{us}}{\partial f_y} = A_v \frac{h-d'}{S}$$

$$\frac{\partial V_{us}}{\partial b} = 0.5 \sqrt{f'_c} \ (h-d')$$

$$\frac{\partial V_{us}}{\partial d'} = 0.5 \sqrt{f'_c}(-b) + \frac{176 A_s \left[(-1) \left\{ \frac{\ell}{2} - \frac{N}{V_{uf}} \frac{1}{8} (3h+d') \right\} - (h-d')(-\frac{N}{V_{uf}} \cdot \frac{1}{8}) \right]}{\left\{ \frac{\ell}{2} - \frac{N}{V_{uf}} \cdot \frac{1}{8} (3h+d') \right\}^2}$$

$$+ (-\frac{A_v f_y}{S})$$

$$\frac{\partial V_{us}}{\partial f'_c} = 0.5 \frac{1}{2} \frac{1}{\sqrt{f'_c}} \ b(h-d')$$

$$\frac{\partial V_{us}}{\partial h} = 0.5\sqrt{f'_c} \cdot b + \frac{176\, A_s\left[\left\{\frac{\ell}{2} - \frac{N}{V_{uf}}\frac{1}{8}(3h+d')\right\} - (h-d')\left(\frac{N}{V_{uf}} \cdot \frac{3}{8}\right)\right]}{\left\{\frac{\ell}{2} - \frac{N}{V_{uf}} \cdot \frac{1}{8}\,(3h+d')\right\}^2}$$

$$+ \frac{A_v f_y}{S}$$

$$\frac{\partial V_{us}}{\partial S} = - \frac{A_v f_y (h-d')}{S^2}$$