MOMENT COEFFICIENT TABLES FOR ONE AND TWO SPAN GABLE FRAMES

By

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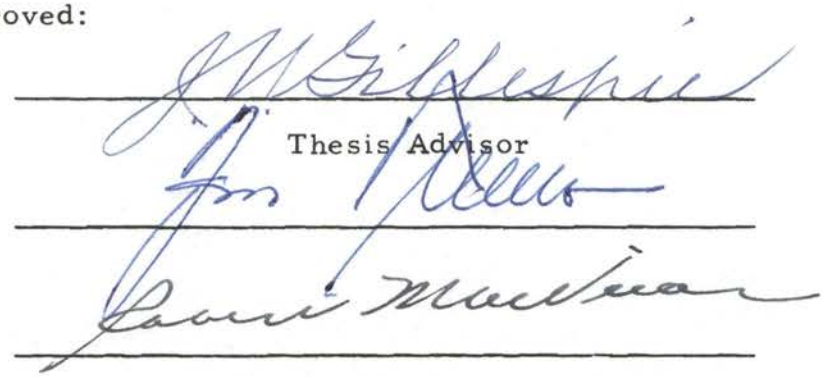

Thesis Advisor

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L. L. H.

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NOMENCLATURE

M_{ij} . . . . . Moment at i on member ij

H_{ij} . . . . . Horizontal thrust at i on member ij

V_{ij} . . . . . Shear at i on member ij

θ_i . . . . . Angular rotation at i

Δ_{ix} . . . . . Horizontal displacement at i

Δ_{jix} . . . . . Relative horizontal displacement $\vec{\Delta}_{jx} - \vec{\Delta}_{ix}$

Q_{ij} . . . . . Moment coefficient for M_{ij}

I . . . . . Moment of inertia

P_i . . . . . Horizontal force at i

w . . . . . Intensity of load

L . . . . . Length of span

α . . . . . Column length parameter

β . . . . . Gable height parameter

γ_1 . . . . . Column moment of inertia parameter

γ_2 . . . . . Gable moment of inertia parameter

ν . . . . . $\sqrt{1 + 4\beta^2}$

η . . . . . Thrust induction factor

CHAPTER I

INTRODUCTION

The purpose of this thesis is to develop moment coefficients for the analysis of one and two span symmetrical gable frames hinged at their base (Fig. 1). These coefficients will enable the designer to assume a trial design and immediately check the sufficiency of the design without the usual tedious and time-consuming analysis.

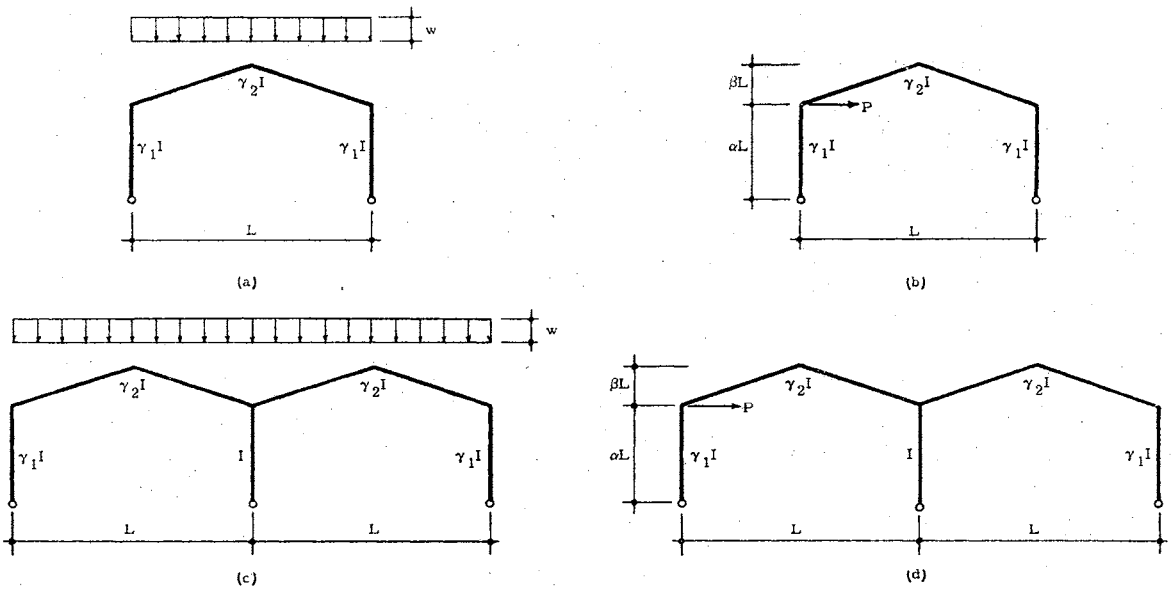


Fig. 1

Gable Frames

Moment coefficients are developed for

1. Uniformly distributed load
2. Horizontal force applied at each joint independently.

The coefficients are developed for ranges of the parameters α, β, γ_1, γ_2 (Fig. 1) which are thought to be practical.

These moment coefficients are presented in tabular form and are a direct extension of the similar coefficients developed by Gillespie (1, 2) and Gillespie and Tuma (3). Similar coefficients for continuous frames with circular and with parabolic girders loaded by a uniformly distributed load were presented by Carmen (4). Larkin (5) developed moment coefficient tables for continuous parabolic frames loaded with a unit force at each joint independently. This previous work was developed for two, three, and four span symmetrical frames with constant moment of inertia; thus, only the parameters α, β were included.

The slope deflection equations used in this thesis were first formulated by Vasquez (6) and Hedges (7) and later shown in terms of the parameters α, β by Gillespie (1, 2) and Gillespie and Tuma (3). The addition of the parameters γ_1, γ_2 is introduced in this thesis. These parameters vary the moments of inertia of the frame members with respect to the moment of inertia of the center column.

Griffiths (8) has developed coefficient charts for single span ridge, rectangular, and parabolic frames. Korn (9) has tabulated moment tables for one span symmetrical gable frames. Tuma, Havner, and Hedges (10) have illustrated a general procedure of analysis for frames of the type studied in this thesis.

The moment coefficient tables are presented in an appendix for

easy reference and use. The application of these tables is illustrated by numerical examples in Chapter IV.

The usually positive reactive and deformation sign conventions are adopted. Positive moments and angular deformations are clockwise, and positive horizontal forces and displacements are to the right. Positive vertical forces are taken upward. Vertical displacements are not considered.

Notation is defined where it first appears and is collected in the front under Nomenclature for easy reference.

CHAPTER II

DEFORMATION EQUATIONS

1. Slope-Deflection Equations

The slope-deflection equations (Eq's. 1, 2) for a typical joint of a symmetrical continuous gable frame are stated in terms of the parameters $\alpha, \beta, \nu, \gamma_1, \gamma_2$, (Fig. 2) where $\nu = \sqrt{1 + 4\beta^2}$. The frame is loaded by a uniform load of intensity w and by horizontal forces P's at

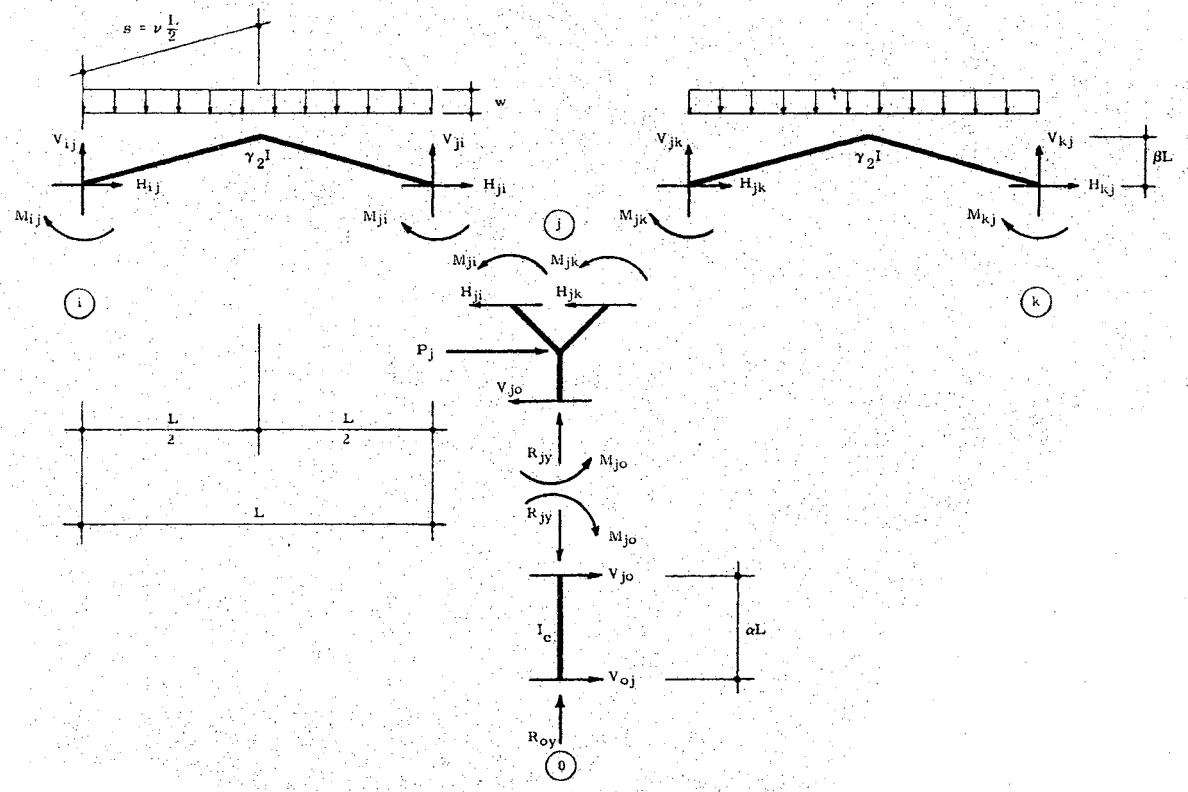


Fig. 2

A Typical Joint

the joints. The column moment of inertia I_c is equal to $\gamma_1 I$ for the exterior columns and to I for the interior column. The gable moment of inertia is equal to $\gamma_2 I$.

Moment equations:

$$M_{ji} = \frac{7E\gamma_2 I}{\nu L}\theta_j - \frac{1E\gamma_2 I}{\nu L}\theta_i + \frac{6E\gamma_2 I}{\beta\nu L^2}\Delta_{jix} + \frac{wL^2}{48}$$

$$M_{jo} = \frac{3EI_c}{\alpha L}\theta_j - \frac{3EI_c}{\alpha^2 L^2}\Delta_{jx} \qquad (1)$$

$$M_{jk} = \frac{7E\gamma_2 I}{\nu L}\theta_j - \frac{1E\gamma_2 I}{\nu L}\theta_k - \frac{6E\gamma_2 I}{\beta\nu L^2}\Delta_{kjx} - \frac{wL^2}{48}$$

Thrust and shear equations:

$$\vec{H}_{ji} = \frac{6E\gamma_2 I}{\beta\nu L^2}\theta_j - \frac{6E\gamma_2 I}{\beta\nu L^2}\theta_i + \frac{12E\gamma_2 I}{\beta^2\nu L^3}\Delta_{jix} - \frac{wL}{8\beta}$$

$$\vec{V}_{jo} = -\frac{3EI_c}{\alpha^2 L^2}\theta_j + \frac{3EI_c}{\alpha^3 L^3}\Delta_{jx} \qquad (2)$$

$$\vec{H}_{jk} = \frac{6E\gamma_2 I}{\beta\nu L^2}\theta_j - \frac{6E\gamma_2 I}{\beta\nu L^2}\theta_k - \frac{12E\gamma_2 I}{\beta^2\nu L^3}\Delta_{kjx} + \frac{wL}{8\beta}$$

2. Equilibrium Equations

Since no vertical displacement is considered, only two static equilibrium conditions need to be satisfied at each joint.

$$\Sigma M_j = 0, \qquad M_{ji} + M_{jo} + M_{jk} = 0 \qquad (3)$$

$$\Sigma F_{jx} = 0, \qquad H_{ji} + V_{jo} + H_{jk} = P_j \qquad (4)$$

3. Matrix Tables

The matrix tables (Tables 1, 2) are formulated for the following load cases:

Case 1 -- One Span Frame

Case 1-0 -- One span frame, uniform load

Case 1-1 -- One span frame, horizontal force at joint (1)

Case 2 -- Two Span Frame

Case 2-0 -- Two span frame, uniform load

Case 2-1 -- Two span frame, horizontal force at joint (1)

Case 2-2 -- Two span frame, horizontal force at joint (2)

The matrices are formed by substituting the deformation equations (Eq's. 1, 2) into the equilibrium equations (Eq's. 3, 4). These matrices are expressed in terms of equivalent X's for each case.

The solution of these matrices and the procurement of the end moment coefficients in terms of

$$\alpha = 0.1\ (0.1)\ 1.0$$

$$\beta = 0.1\ (0.1)\ 0.5$$

$$\gamma_1 = 0.8\ (0.2)\ 1.2$$

$$\gamma_2 = 0.6\ (0.2)\ 1.4$$

is accomplished by means of the IBM 650 digital computer. This computer is housed in the Oklahoma State University Computing Center.

4. Computer Programs

The programs used to obtain the moment coefficients presented in this thesis are written in 650 FORTRAN language. The following two subroutines are incorporated in each program:

1. SQRTF
2. M. I. III

SQRTF is used to compute $\nu = \sqrt{1 + 4\beta^2}$, and M. I. III is the subroutine used for solving the systems of matrix equations (Tables 1, 2). These subroutines are available at the Oklahoma State University Computing Center.

The FORTRAN programs are written for two cases.

Case 1 -- One Span Frame

Case 1-0 -- One span frame, uniform load

Case 1-1 -- One span frame, horizontal force at joint (1)

Case 2 -- Two Span Frame

Case 2-0 -- Two span frame, uniform load

Case 2-1 -- Two span frame, horizontal force at joint (1)

Case 2-2 -- Two span frame, horizontal force at joint (2)

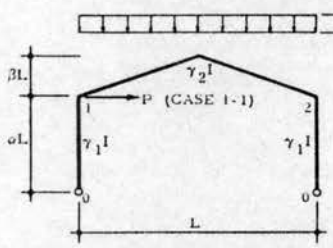
In each case solutions are obtained for each load, independent of the other loads, by means of the M. I. III subroutine.

The 650 FORTRAN system consists of two major parts:

1. The compiler, 650 FORTRAN, which accepts FORTRAN statements and compiles 650 instructions in symbolic (SOAP II) language.
2. The assembler, a modified version of SOAP II, which produces an optimized machine language program from the symbolic instructions.

In processing the FORTRAN program for the two span frame, the object program (2) obtained overloaded the storage capacity of the IBM 650 digital computer. Due to inefficiencies in the FORTRAN system, it was a simple matter to shorten the SOAP II language deck (1); thus, providing sufficient storage to assemble the object program.

TABLE 1 MATRIX TABLE ONE SPAN FRAME



$\alpha = 0.1\,(0.1)\,1.0$

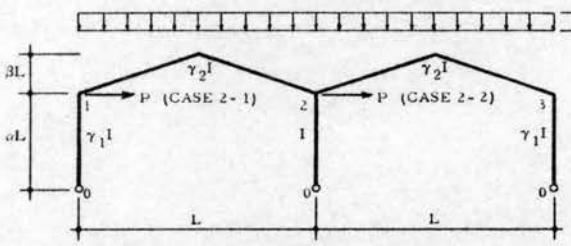
$\beta = 0.1\,(0.1)\,0.5$

$\gamma_1 = 1.0$

$\gamma_2 = 0.6\,(0.2)\,1.4$

MATRIX CONSTANTS	$X_1 = \frac{3EI}{\nu L}\theta_1$	$X_2 = \frac{3EI}{\nu L}\theta_2$	$X_3 = \frac{3EI}{\nu L^2}\Delta_1$	$X_4 = \frac{3EI}{\nu L^2}\Delta_2$	CASE 1-0 wL^2	CASE 1-1 PL
$\Sigma M_1 = 0$	$+\frac{\gamma_1\nu}{\alpha}+\frac{7\gamma_2}{3}$	$-\frac{\gamma_2}{3}$	$-\frac{\gamma_1\nu}{\alpha^2}+\frac{2\gamma_2}{\beta}$	$-\frac{2\gamma_2}{\beta}$	$-\frac{1}{48}$	0
$\Sigma M_2 = 0$	$-\frac{\gamma_2}{3}$	$+\frac{\gamma_1\nu}{\alpha}+\frac{7\gamma_2}{3}$	$-\frac{2\gamma_2}{\beta}$	$-\frac{\gamma_1\nu}{\alpha^2}+\frac{2\gamma_2}{\beta}$	$+\frac{1}{48}$	0
$\Sigma F_{1x} = 0$	$-\frac{\gamma_1\nu}{\alpha^2}+\frac{2\gamma_2}{\beta}$	$-\frac{2\gamma_2}{\beta}$	$+\frac{\gamma_1\nu}{\alpha^3}+\frac{4\gamma_2}{\beta^2}$	$-\frac{4\gamma_2}{\beta^2}$	$+\frac{1}{8\beta}$	-1
$\Sigma F_{2x} = 0$	$-\frac{2\gamma_2}{\beta}$	$-\frac{\gamma_1\nu}{\alpha^2}+\frac{2\gamma_2}{\beta}$	$-\frac{4\gamma_2}{\beta^2}$	$+\frac{\gamma_1\nu}{\alpha^3}+\frac{4\gamma_2}{\beta^2}$	$-\frac{1}{8\beta}$	0

TABLE 2 MATRIX TABLE TWO SPAN FRAME



$\alpha = 0.1\,(0.1)\,1.0$

$\beta = 0.1\,(0.1)\,0.5$

$\gamma_1 = 0.8\,(0.2)\,1.2$

$\gamma_2 = 0.6\,(0.2)\,1.4$

MATRIX CONSTANTS	$X_1 = \frac{3EI}{\nu L}\theta_1$	$X_2 = \frac{3EI}{\nu L}\theta_2$	$X_3 = \frac{3EI}{\nu L}\theta_3$	$X_4 = \frac{3EI}{\nu L^2}\Delta_1$	$X_5 = \frac{3EI}{\nu L^2}\Delta_2$	$X_6 = \frac{3EI}{\nu L^2}\Delta_3$	CASE 2-0 wL^2	CASE 2-1 PL	CASE 2-2 PL
$\Sigma M_1 = 0$	$+\frac{\gamma_1\nu}{\alpha}+\frac{7\gamma_2}{3}$	$-\frac{\gamma_2}{3}$		$-\frac{\gamma_1\nu}{\alpha^2}+\frac{2\gamma_2}{\beta}$	$-\frac{2\gamma_2}{\beta}$		$-\frac{1}{48}$	0	0
$\Sigma M_2 = 0$	$-\frac{\gamma_2}{3}$	$+\frac{\nu}{\alpha}+\frac{14\gamma_2}{3}$	$-\frac{\gamma_2}{3}$	$-\frac{2\gamma_2}{\beta}$	$-\frac{\nu}{\alpha^2}+\frac{4\gamma_2}{\beta}$	$-\frac{2\gamma_2}{\beta}$	0	0	0
$\Sigma M_3 = 0$		$-\frac{\gamma_2}{3}$	$+\frac{\gamma_1\nu}{\alpha}+\frac{7\gamma_2}{3}$		$-\frac{2\gamma_2}{\beta}$	$-\frac{\gamma_1\nu}{\alpha^2}+\frac{2\gamma_2}{\beta}$	$+\frac{1}{48}$	0	0
$\Sigma F_{1x} = 0$	$-\frac{\gamma_1\nu}{\alpha^2}+\frac{2\gamma_2}{\beta}$	$-\frac{2\gamma_2}{\beta}$		$+\frac{\gamma_1\nu}{\alpha^3}+\frac{4\gamma_2}{\beta^2}$	$-\frac{4\gamma_2}{\beta^2}$		$+\frac{1}{8\beta}$	-1	0
$\Sigma F_{2x} = 0$	$-\frac{2\gamma_2}{\beta}$	$-\frac{\nu}{\alpha^2}+\frac{4\gamma_2}{\beta}$	$-\frac{2\gamma_2}{\beta}$	$-\frac{4\gamma_2}{\beta^2}$	$+\frac{\nu}{\alpha^3}+\frac{8\gamma_2}{\beta^2}$	$-\frac{4\gamma_2}{\beta^2}$	0	0	-1
$\Sigma F_{3x} = 0$		$-\frac{2\gamma_2}{\beta}$	$-\frac{\gamma_1\nu}{\alpha^2}+\frac{2\gamma_2}{\beta}$		$-\frac{4\gamma_2}{\beta^2}$	$+\frac{\gamma_1\nu}{\alpha^3}+\frac{4\gamma_2}{\beta^2}$	$-\frac{1}{8\beta}$	0	0

```
C 0000 0  MOMENT COEFFICIENTS FOR ONE
C 0000 1  SPAN GABLE FRAMES FOR UNIFORM
C 0000 2  LOAD AND UNIT FORCE
      1 0  DIMENSION A(5,6),X(4,2)
      2 0  READ1,B,DELT1,H1,C,DELT2,H2
      3 0  READ2,D,DELT3,H3,E,DELT4,H4
      4 0  GAMA1=D
      5 0  BETA=C
      6 0  GAMA2=E
      7 0  ALPHA=B
      8 0  PU=SORTF(1.0+(4.0*BETA**2))
      9 0  A(1,1)=(GAMA1*PU)/(ALPHA)+(7.
      9 1  0*GAMA2)/3.0
     10 0  A(1,2)=-GAMA2/3.0
     11 0  A(1,3)=-(GAMA1*PU)/(ALPHA**2)
     11 1  +(2.0*GAMA2)/BETA
     12 0  A(1,4)=-(2.0*GAMA2)/BETA
     13 0  A(1,5)=1.0/48.0
     14 0  A(1,6)=0
     15 0  A(2,1)= A(1,2)
     16 0  A(2,2)= A(1,1)
     17 0  A(2,3)= A(1,4)
     18 0  A(2,4)= A(1,3)
     19 0  A(2,5)=-1.0/48.0
     20 0  A(2,6)=0
     21 0  A(3,1)= A(1,3)
     22 0  A(3,2)= A(1,4)
     23 0  A(3,3)=(GAMA1*PU)/(ALPHA**3)
     23 1  +(4.0*GAMA2)/(BETA**2)
     24 0  A(3,4)=-(4.0*GAMA2)/(BETA**2)
     25 0  A(3,5)=-1.0/(8.0*BETA)
     26 0  A(3,6)=1.0
     27 0  A(4,1)= A(1,4)
     28 0  A(4,2)=A(1,3)
     29 0  A(4,3)= A(3,4)
     30 0 A(4,4)= A(3,3)
     31 0  A(4,5)=1.0/(8.0*BETA)
     32 0  A(4,6)=0
     33 0  DUMMY=SOLVF(4,2,5,6)
     43 0  PUNCH,ALPHA,BETA,GAMA1,GAMA2
    341 0  PUNCH,A(1,1),A(2,1),A(3,1),
    341 1  A(4,1)
    342 0  PUNCH,A(1,2),A(2,2),A(3,2),
    342 1  A(4,2)
     35 0  B101=((GAMA1*PU)/(ALPHA))*A(1
     35 1  ,1)-((GAMA1*PU)/(ALPHA**2))*
     35 2  A(3,1)
     36 0  B121=((7.0*GAMA2)/(3.0))*A(1,
     36 1  1)-(GAMA2/3.0)*A(2,1)+((2.0*
     36 2  GAMA2)/BETA)*A(3,1)-((2.0*GAM
     36 3  A2)/BETA)*A(4,1)-1.0/48.0
     37 0  B211=-(GAMA2/3.0)*A(1,1)+((7.
     37 1  0*GAMA2)/3.0)*A(2,1)-((2.0*GA
     37 2  MA2)/BETA)*A(3,1)+((2.0*GAMA2
     37 3  )/BETA)*A(4,1)+1.0/48.0
     38 0  B201=((GAMA1*PU)/ALPHA)*A(2,1
     38 1  )-((GAMA1*PU)/(ALPHA**2))*A(4
     38 2  ,1)
     39 0  V101= B101/ALPHA
     40 0  H121=((2.0*GAMA2)/BETA)*A(1,1
     40 1  )-((2.0*GAMA2)/BETA)*A(2,1)+((
     40 2  4.0*GAMA2)/(BETA**2))*A(3,1)-
     40 3  ((4.0*GAMA2)/(BETA**2))*A(4,1
     40 4  )
    405 0  H121=H121+1.0/(8.0*BETA)
     44 0  PUNCH,B101,B121,B211,B201,
     44 1  V101,H121
     45 0  B102=((GAMA1*PU)/(ALPHA))*A(1
     45 1  ,2)-((GAMA1*PU)/(ALPHA**2))*
     45 2  A(3,2)
     46 0  B122=((7.0*GAMA2)/(3.0))*A(1,
     46 1  2)-(GAMA2/3.0)*A(2,2)+((2.0*
     46 2 GAMA2)/BETA)*A(3,2)-((2.0*GAM
     46 3  A2)/BETA)*A(4,2)
     47 0  B202=((GAMA1*PU)/ALPHA)*A(2,2
     47 1  )-((GAMA1*PU)/(ALPHA**2))*A(4
     47 2  ,2)
     49 0  B212=-(GAMA2/3.0)*A(1,2)+((7.
     49 1  0*GAMA2)/3.0)*A(2,2)-((2.0*GA
     49 2  MA2)/BETA)*A(3,2)+((2.0*GAMA2
     49 3  )/BETA)*A(4,2)
     50 0  H122=((2.0*GAMA2)/BETA)*A(1,2
     50 1  )-((2.0*GAMA2)/BETA)*A(2,2)+((
     50 2  4.0*GAMA2)/(BETA**2))*A(3,2)-
     50 3  ((4.0*GAMA2)/(BETA**2))*A(4,2
     50 4  )
     52 0  V102= B102/ALPHA
     54 0  PUNCH,B102,B122,B212,B202,
     54 1  V102,H122
     55 0  IF(ALPHA-H1)56,58,67
     56 0  ALPHA=ALPHA+DELT1
     57 0  GO TO 9
     58 0  IF(GAMA2-H4)59,61,67
     59 0  GAMA2=GAMA2+DELT4
     60 0  GO TO 7
     61 0  IF(BETA-H2)62,64,67
     62 0  BETA=BETA+DELT2
     63 0  GO TO 6
     64 0  IF(GAMA1-H3)65,67,67
     65 0  GAMA1=GAMA1+DELT3
     66 0  GO TO 5
     67 0  PAUSE
     68 0  END
```

Fig. 3

FORTRAN Program

One Span Frame

```
C 0000 0   MOMENT COEFFICIENTS FOR TWO
C 0000 1   SPAN GABLE FRAMES FOR UNIFORM
C 0000 2   LOAD AND UNIT FORCES
      1 0   DIMENSION A(7,9),X(6,3)
   1000 0   DIMENSION B10 (3),B12 (3),
   1000 1 B21 (3),B20 (3),B23 (3),
   1000 2 B32 (3),B30 (3),CC(3)
      2 0   READ1,B,DELT1,H1,C,DELT2,H2
      3 0   READ2,D,DELT3,H3,E,DELT4,H4
      4 0   GAMA1=D
      5 0   BETA=C
      6 0   GAMA2=E
      7 0   ALPHA=B
      8 0   PU=SQRTF(1.0+(4.0*BETA**2))
      9 0   A(1,1)=(GAMA1*PU)/ALPHA+(7.0
      9 1  *GAMA2)/3.0
     10 0   A(1,2)=-GAMA2/3.0
     11 0   A(1,3)=0
     12 0   A(1,4)=-(GAMA1*PU)/(ALPHA**2)
     12 1  +(2.0*GAMA2)/BETA
     13 0   A(1,5)=-(2.0*GAMA2)/BETA
     14 0   A(1,6)=0
     15 0   A(1,7)=1.0/48.0
     16 0   A(1,8)=0
     17 0   A(1,9)=0
     18 0   A(2,1)= A(1,2)
     19 0   A(2,2)=PU/ALPHA+(14.0*GAMA2)/
     19 1  3.0
     20 0   A(2,3)= A(1,2)
     21 0   A(2,4)= A(1,5)
     22 0   A(2,5)=-PU/(ALPHA**2)+(4.0*GA
     22 1  MA2)/BETA
     23 0   A(2,6)= A(1,5)
     24 0   A(2,7)=0
     25 0   A(2,8)=0
     26 0   A(2,9)=0
     27 0   A(3,1)=0
     28 0   A(3,2)= A(1,2)
     29 0   A(3,3)= A(1,1)
     30 0   A(3,4)=0
     31 0   A(3,5)= A(1,5)
     32 0   A(3,6)= A(1,4)
     33 0   A(3,7)=-1.0/48.0
     34 0   A(3,8)=0
     35 0   A(3,9)=0
     36 0   A(4,1)= A(1,4)
     37 0   A(4,2)= A(1,5)
     38 0   A(4,3)=0
     39 0   A(4,4)=(GAMA1*PU)/(ALPHA**3)+
     39 1  (4.0*GAMA2)/(BETA**2)
     40 0   A(4,5)=-(4.0*GAMA2)/(BETA**2)
     41 0   A(4,6)=0
     42 0   A(4,7)=-1.0/(8.0*BETA)
     43 0   A(4,8)=1.0
     44 0   A(4,9)=0
     45 0   A(5,1)= A(1,5)
     46 0   A(5,2)= A(2,5)
     47 0   A(5,3)= A(1,5)
     48 0   A(5,4)= A(4,5)
     49 0   A(5,5)=PU/(ALPHA**3)+(8.0*GAM
     49 1  A2)/(BETA**2)
     50 0   A(5,6)= A(4,5)
     51 0   A(5,7)=0
     52 0   A(5,8)=0
     53 0   A(5,9)=1.0
     54 0   A(6,1)=0
     55 0   A(6,2)= A(1,5)
     56 0   A(6,3)= A(1,4)
     57 0   A(6,4)=0
     58 0   A(6,5)= A(4,5)
     59 0   A(6,6)= A(4,4)
     60 0   A(6,7)=1.0/(8.0*BETA)
     61 0   A(6,8)=0
     62 0   A(6,9)=0
     63 0   DUMMY=SOLVF(6,3,7,9)
    111 0   PUNCH,ALPHA,BETA,GAMA1,GAMA2
    642 0   PUNCH,A(1,1),A(2,1),A(3,1),
    642 1   A(4,1),A(5,1),A(6,1)
    643 0   PUNCH,A(1,2),A(2,2),A(3,2),
    643 1   A(4,2),A(5,2),A(6,2)
    644 0   PUNCH,A(1,3),A(2,3),A(3,3),
    644 1   A(4,3),A(5,3),A(6,3)
    645 0 CC(1)   =1.0/48.0
    646 0 CC(2)   =0
    647 0 CC(3)   =0
    641 0    DO 112 I=1,3
     65 0 B10(I)=((GAMA1*PU)/ALPHA)*A(1,
     65 1 I)-((GAMA1*PU)/(ALPHA**2))*A(4
     65 2  ,I)
     66 0 B12(I)=((7.0*GAMA2)/3.0)*A(1,I
     66 1 )-(GAMA2/3.0)*A(2,I)+((2.0*GAM
     66 2 A2)/BETA)*A(4,I)-((2.0*GAMA2)
     66 3  /BETA)*A(5,I)-CC(I)
     67 0 B21(I)=-(GAMA2/3.0 )*A(1,I)+((
     67 1 7.0*GAMA2)/3.0)*A(2,I)-((2.0*G
     67 2  AMA2)/BETA)*A(4,I)+((2.0*GAMA
     67 3  2)/BETA)*A(5,I)+CC(I)
     68 0 B20(I)=(PU/ALPHA)*A(2,I)-(PU/(
     68 1 ALPHA**2))*A(5,I)
     69 0 B23(I)=((7.0*GAMA2)/3.0)*A(2,I
     69 1 )-(GAMA2/3.0)*A(3,I)+((2.0*GAM
     69 2  A2)/BETA)*A(5,I)-((2.0*GAMA2)
     69 3  /BETA)*A(6,I)-CC(I)
     70 0 B32(I)=-(GAMA2/3.)*A(2,I)+((7.
     70 1  0*GAMA2)/3.0)*A(3,I)-((2.0*GA
     70 2  MA2)/BETA)*A(5,I)+((2.0*GAMA2
     70 3  )/BETA)*A(6,I)+CC(I)
     71 0 B30(I)=((GAMA1*PU)/ALPHA)*A(3,
     71 1 I)-((GAMA1*PU)/(ALPHA**2))*A(6
     71 2  ,I)
    112 0   PUNCH,B10(I),B12(I),B21(I),
    112 1 B20(I),B23(I),B32(I),B30(I)
    113 0   IF(ALPHA-H1)114,116,125
    114 0   ALPHA=ALPHA+DELT1
    115 0   GO TO 9
    116 0   IF(GAMA2-H4)117,119,125
    117 0   GAMA2=GAMA2+DELT4
    118 0   GO TO 7
    119 0   IF(BETA-H2)120,122,125
    120 0   BETA=BETA+DELT2
    121 0   GO TO 6
    122 0   IF(GAMA1-H3)123,125,125
    123 0   GAMA1=GAMA1+DELT3
    124 0   GO TO 5
    125 0   PAUSE
    126 0   END
```

Fig. 4

FORTRAN Program

Two Span Frame

CHAPTER III

MOMENT COEFFICIENT TABLES

1. General Notes

The end moment coefficient tables are presented in the appendix for convenience of application. The tables are designated as follows:

Table 1-0 -- One span frame, uniform load

Table 1-1 -- One span frame, horizontal force at joint (1)

Table 2-0 -- Two span frame, uniform load

Table 2-1 -- Two span frame, horizontal force at joint (1)

Table 2-2 -- Two span frame, horizontal force at joint (2)

The first table number refers to the number of spans. The second number refers to the type of loading; and, in the case of the unit horizontal force, designates the joint at which the force is applied.

Each table consists of the following major parts:

1. Table number and title
2. Illustration of frame (A figure with symbols which define joints, geometry, load, and moments of inertia)
3. Column moment of inertia parameter -- γ_1
4. Gable moment of inertia parameter -- γ_2
5. Column length parameter -- α
6. Gable height parameter -- β
7. End moment coefficient -- Q
8. End moment equations -- $M_{ij} = \pm Q_{ij} wL^2$ or $M_{ij} = \pm Q_{ij} PL$

2. Application Procedure

A procedure for the analysis of one and two span frames loaded by any general system of loads is outlined below.

1. Determine parameters α , β , γ_1 , γ_2 .
2. Compute end moments at each joint due to applied loads, fixing all joints against translation.
3. Compute horizontal thrusts and shears.
4. Calculate the balancing force at each joint, $H_{ji} + V_{jo} + H_{jk} = - P_j$.
5. Select proper table or tables.
6. Select the end moment coefficient Q corresponding to the values of α, β, γ_1, γ_2 previously determined (1).
7. Compute the end moments due to the balancing force P_j at each joint (3) using the equation $M_{ij} = \pm Q_{ij}PL$.
8. Add algebraically the results of (2) and (7) to obtain final moments.

For the special load cases presented in this thesis

1. Uniformly distributed load
2. Horizontal force applied at each joint independently,

steps 2, 3, 4 of the above procedure may be omitted. Numerical examples in Chapter IV further explain the application procedure.

CHAPTER IV

ILLUSTRATIVE EXAMPLES

1. General Notes

The application of the end moment coefficient tables to the analysis of one and two span symmetrical gable frames is presented in this chapter. Three numerical examples are solved to illustrate the application of the results presented in this thesis to one and two span gable frames loaded by any general loading. The procedure outlined in Chapter III is followed.

2. Example 1

A one span gable frame loaded by a uniformly distributed wind load (Fig. 5) is analyzed by the method of moment distribution and the moment coefficient tables.

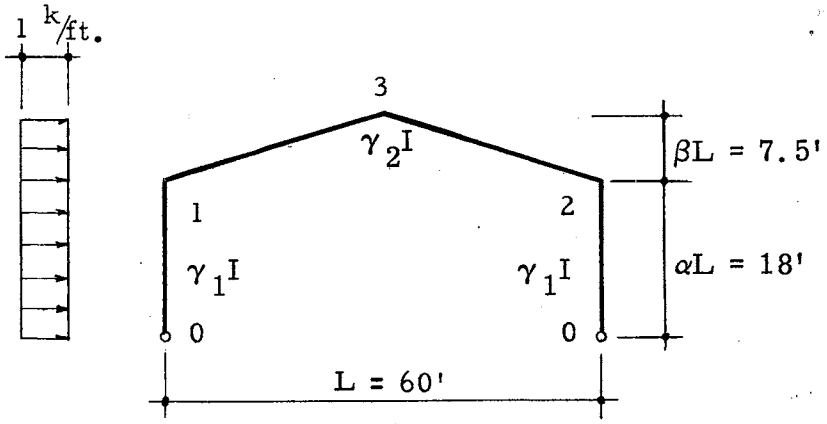


Fig. 5

Wind Load

One Span Frame

1. Parameters:

$$\gamma_1 = 1.0 \qquad \gamma_2 = 0.8$$

$$\alpha = \frac{18}{60} = 0.300 \qquad \beta = \frac{7.5}{60} = 0.125$$

2. End Moments, Joints Fixed Against Translation:

The peak of the gable will be considered as an additional joint (3) and moment distribution for straight members will be applied in this example.

(a) Stiffness Factors

$$K'_{10} = K'_{20} = \frac{3 E \gamma_1 I}{\alpha L} = 0.167 \text{ EI}$$

$$K'_{13} = K'_{31} = K_{32} = K_{23} = \frac{4 E \gamma_2 I}{s} = 0.104 \text{ EI}$$

(b) Distribution Factors

$$D_{10} = D_{20} = 0.616$$

$$D_{13} = D_{23} = 0.384$$

$$D_{31} = D_{32} = 0.500$$

(c) Carry-Over Factors

$$C_{10} = C_{20} = 0$$

$$C_{13} = C_{31} = C_{32} = C_{23} = 0.500$$

(d) Fixed End and Propped End Moments

$$EM_{10} = + \frac{3}{2} \frac{w(\alpha L)^2}{12} = + 40.50 \text{ k-ft.}$$

$$FM_{13} = - FM_{31} = - \frac{w(\beta L)^2}{12} = - 4.69 \text{ k-ft.}$$

(e) Distribution Table

	(1)		(3)		(2)	
	10	13	31	32	23	20
- D's	- .616	- .384	- .500	- .500	- .384	- .616
C's		→ + .500	← + .500	→ + .500	← + .500	
FM's	+ 40.50	- 4.69	+ 4.69			
	- 22.06	- 13.75	- 2.35	- 2.34		
		- 1.17	- 6.88		- 1.17	
	+ .72	+ .45	+ 3.44	+ 3.44	+ .45	+ .72
		+ 1.72	+ .23	+ .23	+ 1.72	
	- 1.06	- .66	- .23	- .23	- .66	- 1.06
		- .12	- .33	- .33	- .12	
	+ .08	+ .04	+ .33	+ .33	+ .04	+ .08
RM's	- 22.32	- 13.49	- 5.79	+ 1.10	+ .26	- .26
M's	+ 18.18	- 18.18	- 1.10	+ 1.10	+ .26	- .26

3. Horizontal Thrusts and Shears:

$H_{12} = -\ 6.87$ k. $\qquad H_{21} = -\ 0.50$ k.

$V_{10} = -\ 10.01$ k. $\qquad V_{20} = +\ 0.01$ k.

4. Balancing Forces:

(a) Joint 1

$$H_{12} + V_{10} = -\ 6.87 - 10.01 = -\ 16.88 \text{ k.}$$

(b) Joint 2

$$H_{21} + V_{20} = -\ 0.50 + 0.01 = -\ 0.49 \text{ k.}$$

Thus

$P_1 = +\ 16.88$ k. $\qquad P_2 = +\ 0.49$ k.

$P_1L = +\ 1012.80$ k-ft. $\qquad P_2L = +\ 29.40$ k-ft.

5. Select Proper Table or Tables:

Table 1-1

6. End Moment Coefficients:

$$\begin{bmatrix} Q_{12}^{(1)} & Q_{12}^{(2)} \\ Q_{21}^{(1)} & Q_{21}^{(2)} \end{bmatrix} = \begin{bmatrix} +.174202 & +.125798 \\ +.125798 & +.174202 \end{bmatrix}$$

7. End Moments Due to Balancing Forces:

$$\begin{bmatrix} M_{12}^{(P)} \\ M_{21}^{(P)} \end{bmatrix} = \begin{bmatrix} Q_{12}^{(1)} & Q_{12}^{(2)} \\ Q_{21}^{(1)} & Q_{21}^{(2)} \end{bmatrix} \begin{bmatrix} P_1 L \\ P_2 L \end{bmatrix}$$

$$\begin{bmatrix} M_{12}^{(P)} \\ M_{21}^{(P)} \end{bmatrix} = \begin{bmatrix} +.174202 & +.125798 \\ +.125798 & +.174202 \end{bmatrix} \begin{bmatrix} +1012.80 \\ +29.40 \end{bmatrix} = \begin{bmatrix} +180.13 \text{ k-ft.} \\ +132.53 \text{ k-ft.} \end{bmatrix}$$

8. Final End Moments:

		Ref. 8	Ref. 9
M_{12}	+161.95	+162.80	+163.24
M_{21}	+132.79	+134.20	+133.76

The final end moments are compared with those from Griffiths (8) and Korn (9).

3. Example 2

A two span symmetrical gable frame loaded by a drift load (Fig. 6) is analyzed by the method of moment distribution and the moment coefficient tables.

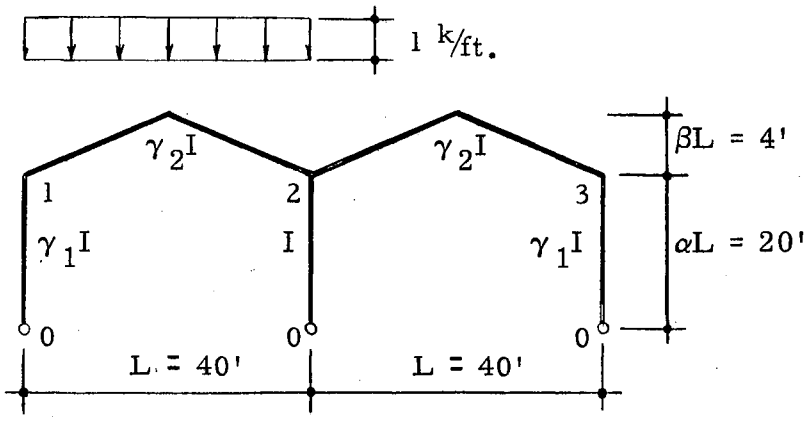


Fig. 6

Drift Load

Two Span Frame

1. Parameters:

$$\gamma_1 = 1.2 \qquad \gamma_2 = 1.4$$

$$\alpha = \frac{20}{40} = 0.5 \qquad \beta = \frac{4}{40} = 0.1$$

2. End Moments, Joints Fixed Against Translation:

The moment distribution and computation of thrusts for this example will be carried out considering the gable members as single structural elements.

(a) Stiffness Factors

$$K'_{10} = K'_{20} = K'_{30} = \frac{3 E \gamma_1 I}{\alpha L} = 0.180 EI$$

$$K_{12} = K_{21} = K_{23} = K_{32} = \frac{7 E \gamma_2 I}{2s} = 0.240 EI$$

(b) Distribution Factors

$D_{10} = D_{20} = 0.428$

$D_{12} = D_{32} = 0.572$

$D_{21} = 0.364$

$D_{20} = 0.272$

$D_{23} = 0.364$

(c) Carry-Over Factors

$C_{10} = C_{20} = C_{30} = 0$

$C_{12} = C_{21} = C_{23} = C_{32} = -0.143$

(d) Fixed End Moments

$$FM_{12} = -FM_{21} = -\frac{wL^2}{48} = -33.33 \text{ k-ft.}$$

(e) Distribution Table

	(1)			(2)		(3)	
	10	12	21	20	23	32	30
- D's	- .428	- .572	- .364	- .272	- .364	- .572	- .428
C's		→ - .143	← - .143		→ - .143	← - .143	
FM's		- 33.33	+ 33.33				
	+ 14.28	+ 19.05	- 12.14	- 9.05	- 12.14		
		+ 1.74	- 2.72			+ 1.74	
	- .75	- .99	+ .99	+ .74	+ .99	- .99	- .75
		- .14	+ .14		+ .14	- .14	
	+ .06	+ .08	- .10	- .08	- .10	+ .08	+ .06
RM's	+ 13.59	+ 19.74	- 13.83	- 8.39	- 11.11	+ .69	- .69
M's	+ 13.59	- 13.59	+ 19.50	- 8.39	- 11.11	+ .69	- .69

3. Horizontal Thrusts and Shears:

(a) Thrust Induction Factor

$$\eta_{12} = -\eta_{21} = \eta_{23} = -\eta_{32} = \frac{3}{4\beta L} = +0.1875$$

(b) Fixed End Thrusts

$$FH_{12} = -FH_{21} = +\frac{wL^2}{8\beta L} = +50.00$$

(c) Thrusts Due to Rotations

$$\begin{bmatrix} RH_{12} \\ RH_{21} \\ RH_{23} \\ RH_{32} \end{bmatrix} = \begin{bmatrix} RM_{12} & RM_{21} & 0 & 0 \\ RM_{21} & RM_{12} & 0 & 0 \\ 0 & 0 & RM_{23} & RM_{32} \\ 0 & 0 & RM_{32} & RM_{23} \end{bmatrix} \begin{bmatrix} \eta_{12} \\ \eta_{21} \\ \eta_{23} \\ \eta_{32} \end{bmatrix}$$

$$\begin{bmatrix} RH_{12} \\ RH_{21} \\ RH_{23} \\ RH_{32} \end{bmatrix} = \begin{bmatrix} +19.74 & -13.83 & 0 & 0 \\ -13.83 & +19.74 & 0 & 0 \\ 0 & 0 & -11.11 & +0.69 \\ 0 & 0 & +0.69 & -11.11 \end{bmatrix} \begin{bmatrix} +0.1875 \\ -0.1875 \\ +0.1875 \\ -0.1875 \end{bmatrix} = \begin{bmatrix} +6.29 \\ -6.29 \\ -2.21 \\ +2.21 \end{bmatrix}$$

(d) Total Horizontal Thrusts

$$\begin{bmatrix} H_{12} \\ H_{21} \\ H_{23} \\ H_{32} \end{bmatrix} = \begin{bmatrix} RH_{12} \\ RH_{21} \\ RH_{23} \\ RH_{32} \end{bmatrix} + \begin{bmatrix} FH_{12} \\ FH_{21} \\ FH_{23} \\ FH_{32} \end{bmatrix} = \begin{bmatrix} +56.29 \\ -56.29 \\ -2.21 \\ +2.21 \end{bmatrix}$$

(e) End Shears

$$\begin{bmatrix} V_{10} \\ V_{20} \\ V_{30} \end{bmatrix} = -\frac{1}{\alpha L} \begin{bmatrix} M_{10} \\ M_{20} \\ M_{30} \end{bmatrix} = \begin{bmatrix} -0.68 \\ +0.42 \\ +0.03 \end{bmatrix}$$

4. Balancing Forces:

(a) Joint 1

$H_{12} + V_{10} = + 56.29 - 0.68 = + 55.61$ k.

(b) Joint 2

$H_{21} + V_{20} + H_{23} = - 56.29 + 0.42 - 2.21 = - 58.08$ k.

(c) Joint 3

$H_{32} + V_{30} = + 2.21 + 0.03 = + 2.24$ k.

Thus

$$P_1 = - \quad 55.61 \qquad P_2 = + \quad 58.08 \qquad P_3 = - \quad 2.24$$

$$P_1L = - 2224.40 \qquad P_2L = + 2323.20 \qquad P_3L = - 89.60$$

5. Select Proper Table or Tables:

Tables 2-1, 2

6. End Moment Coefficients:

$$\begin{bmatrix} Q_{12}^{(1)} & Q_{12}^{(2)} & Q_{12}^{(3)} \\ Q_{21}^{(1)} & Q_{21}^{(2)} & Q_{21}^{(3)} \\ Q_{20}^{(1)} & Q_{20}^{(2)} & Q_{20}^{(3)} \\ Q_{23}^{(1)} & Q_{23}^{(2)} & Q_{23}^{(3)} \\ Q_{32}^{(1)} & Q_{32}^{(2)} & Q_{32}^{(3)} \end{bmatrix} = \begin{bmatrix} + .166059 & + .135314 & + .135009 \\ + .072058 & + .114686 & + .126875 \\ + .198933 & + .229372 & + .198933 \\ + .126875 & + .114686 & + .072058 \\ + .135009 & + .135314 & + .166059 \end{bmatrix}$$

7. End Moments Due to Balancing Forces:

$$\begin{bmatrix} M_{12}^{(P)} \\ M_{21}^{(P)} \\ M_{20}^{(P)} \\ M_{23}^{(P)} \\ M_{32}^{(P)} \end{bmatrix} = \begin{bmatrix} Q_{12}^{(1)} & Q_{12}^{(2)} & Q_{12}^{(3)} \\ Q_{21}^{(1)} & Q_{21}^{(2)} & Q_{21}^{(3)} \\ -Q_{20}^{(1)} & -Q_{20}^{(2)} & -Q_{20}^{(3)} \\ Q_{23}^{(1)} & Q_{23}^{(2)} & Q_{23}^{(3)} \\ Q_{32}^{(1)} & Q_{32}^{(2)} & Q_{32}^{(3)} \end{bmatrix} \begin{bmatrix} P_1 L \\ \\ P_2 L \\ \\ P_3 L \end{bmatrix}$$

$$\begin{bmatrix} M_{12}^{(P)} \\ M_{21}^{(P)} \\ M_{20}^{(P)} \\ M_{23}^{(P)} \\ M_{32}^{(P)} \end{bmatrix} = \begin{bmatrix} +.166059 & +.135314 & +.135009 \\ +.072058 & +.114686 & +.126875 \\ -.198933 & -.229372 & -.198933 \\ +.126875 & +.114686 & +.072058 \\ +.135009 & +.135314 & +.166059 \end{bmatrix} \begin{bmatrix} -2224.40 \\ \\ +2323.20 \\ \\ -89.60 \end{bmatrix} = \begin{bmatrix} -67.12 \\ +94.78 \\ -72.54 \\ -22.24 \\ -0.80 \end{bmatrix}$$

8. Final End Moments:

$$\begin{bmatrix} M_{12} \\ M_{21} \\ M_{20} \\ M_{23} \\ M_{32} \end{bmatrix} = \begin{bmatrix} -80.71 \\ +114.28 \\ -80.93 \\ -33.35 \\ -0.11 \end{bmatrix}$$

4. Example 3

A two span symmetrical gable frame loaded by a horizontal force (Fig. 7) is analyzed by the moment coefficient tables.

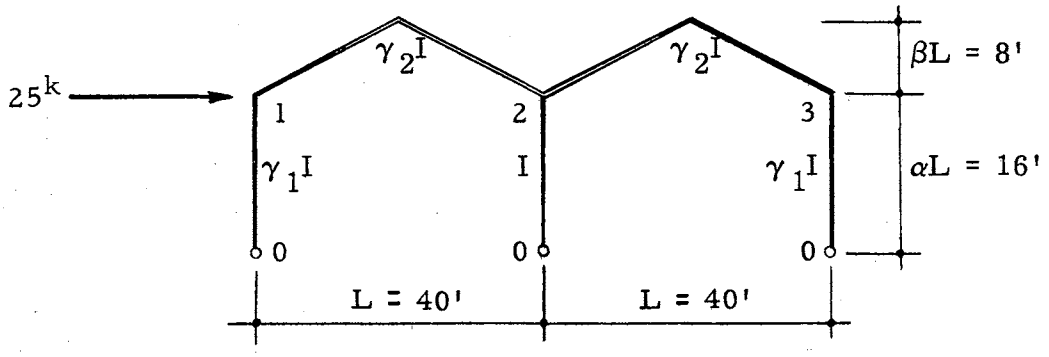


Fig. 7

Horizontal Force

Two Span Frame

1. Parameters:

$$\gamma_1 = 0.8 \qquad \gamma_2 = 1.4$$

$$\alpha = \frac{16}{40} = 0.4 \qquad \beta = \frac{8}{40} = 0.2$$

$$PL = (25)(40) = 1000 \text{ k-ft.}$$

Since there are no fixed end moments, steps 2, 3, 4 can be eliminated in the procedure of analysis.

5. Select Proper Table or Tables:

Table 2-1

6. End Moment Coefficients:

$$\begin{bmatrix} Q_{12}^{(1)} \\ Q_{21}^{(1)} \\ Q_{20}^{(1)} \\ Q_{23}^{(1)} \\ Q_{32}^{(1)} \end{bmatrix} = \begin{bmatrix} +.153094 \\ +.030988 \\ +.156832 \\ +.125844 \\ +.090073 \end{bmatrix}$$

7, 8. End Moments Due to Balancing Forces, Final Moments:

$$\begin{bmatrix} M_{12} \\ M_{21} \\ M_{20} \\ M_{23} \\ M_{32} \end{bmatrix} = \begin{bmatrix} Q_{12}^{(1)} \\ Q_{21}^{(1)} \\ -Q_{20}^{(1)} \\ Q_{23}^{(1)} \\ Q_{32}^{(1)} \end{bmatrix} \begin{bmatrix} \\ \\ P_1 L \\ \\ \end{bmatrix}$$

$$\begin{bmatrix} M_{12} \\ M_{21} \\ M_{20} \\ M_{23} \\ M_{32} \end{bmatrix} = \begin{bmatrix} +.153094 \\ +.030988 \\ -.156832 \\ +.125844 \\ +.090073 \end{bmatrix} \begin{bmatrix} \\ +1000.00 \\ \\ \\ \end{bmatrix} = \begin{bmatrix} +153.09 \\ +30.99 \\ -156.83 \\ +125.84 \\ +90.07 \end{bmatrix}$$

CHAPTER V

SUMMARY AND CONCLUSIONS

1. Summary

Slope deflection matrices for one and two span symmetrical gable frames hinged at the base and loaded by

1. Uniformly distributed load
2. Unit force applied at each joint independently

are expressed in terms of the parameters α, β, γ_1, γ_2. Solutions of these matrices yield deformation equivalents (X's) which were substituted into the slope deflection equations (Eq's. 1, 2) to obtain the end moment coefficients. This process was performed by the IBM 650 digital computer for the following combinations of parameters:

$$\alpha = 0.1\ (0.1)\ 1.0$$

$$\beta = 0.1\ (0.1)\ 0.5$$

$$\gamma_1 = 0.8\ (0.2)\ 1.2$$

$$\gamma_2 = 0.6\ (0.2)\ 1.4$$

End moment coefficient tables are presented in the appendix for accessibility.

A procedure of application was outlined in Chapter III, and illustrated by numerical examples in Chapter IV.

2. Conclusions

The analysis of one and two span symmetrical gable frames is greatly accelerated by application of the moment coefficient tables presented in this thesis. These moment coefficients lead to an accurate analysis of these type frames. By linear interpolation from the tables, sufficient accuracy can also be obtained for intermediate values of the parameters.

The data presented in this thesis could be extended to include frames with more than two spans, and also unsymmetrical frames. Development of tables for three and four span continuous gable frames, symmetrical and unsymmetrical, is in process.

A SELECTED BIBLIOGRAPHY

1. Gillespie, J. W., "Tables and Nomographic Charts for the Preliminary Analysis of Continuous Rigid Frames with Bent Members." M.S. Thesis, Oklahoma State University, Stillwater, 1958.

2. Gillespie, J. W., "Analysis of Continuous Gable Frames by Electronic Computer." Unpublished Report, School of Civil Engineering, Oklahoma State University, Stillwater, 1960.

3. Gillespie, J. W., and Tuma, J. J., "Preliminary Analysis of Continuous Gable Frames." Proceedings, ASCE, Vol. 86, 1960.

4. Carmen, D. C., "Tables and Nomographic Charts for the Preliminary Analysis of Rigid Frames with Curved Members." M.S. Thesis, Oklahoma State University, Stillwater, 1958.

5. Larkin, R. J., "Moment Coefficients for Continuous Rigid Frames with Parabolic Members." M.S. Thesis, Oklahoma State University, Stillwater, 1959.

6. Vasquez, A., "A Method of Analysis of Structures with Symmetrical Members." M.S. Report, Oklahoma State University, Stillwater, 1955.

7. Hedges, F., "Moment Distribution in Frames with Bent Members." M.S. Report, Oklahoma State University, Stillwater, 1956.

8. Griffiths, J. D., "Single Span Rigid Frames in Steel." AISC Publication, New York, 1948.

9. Korn, M. P., Steel Rigid Frames Manual. Ann Arbor, Michigan, 1953.

10. Tuma, J. J., Havner, K. S. and Hedges, F., "Analysis of Frames with Curved and Bent Members." Proceedings, ASCE, Vol. 84, 1958.

APPENDIX

MOMENT COEFFICIENT TABLES

End moment coefficient tables for one and two span symmetrical gable frames are presented for the following cases:

Case 1 -- One Span Frame

Table 1-0 -- One span frame, uniform load

Table 1-1 -- One span frame, horizontal force applied at joint (1)

Case 2 -- Two Span Frame

Table 2-0 -- Two span frame, uniform load

Table 2-1 -- Two span frame, horizontal force applied at joint (1)

Table 2-2 -- Two span frame, horizontal force applied at joint (2)

The tables are tabulated for the following ranges of the parameters α, β, γ_1, γ_2:

α = 0.1 (0.1) 1.0

β = 0.1 (0.1) 0.5

γ_1 = 0.8 (0.2) 1.2

γ_2 = 0.6 (0.2) 1.4

where,

α = column height parameter

β = gable height parameter

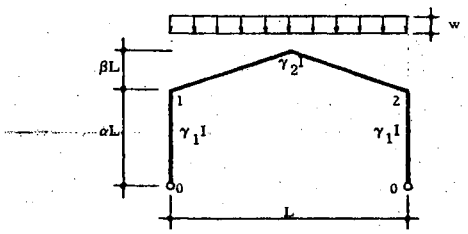
γ_1 = column section parameter

γ_2 = gable section parameter.

For intermediate parameter values, linear interpolation from the tables gives accurate results.

Numerical examples in Chapter IV illustrate the application procedure.

TABLE 1-0 MOMENT COEFFICIENTS ONE SPAN FRAME



$$M_{12} = -Q_{12}\, wL^2$$
$$M_{21} = +Q_{12}\, wL^2$$

$\gamma_1 = 1.0$ $\gamma_2 = 0.6$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.057076	.042901	.034059	.028141	.023935
0.2	.065818	.056245	.048653	.042654	.037863
0.3	.067669	.061288	.055584	.050595	.046266
0.4	.067488	.063154	.058995	.055086	.051470
0.5	.066515	.063554	.060578	.057617	.054719
0.6	.065200	.063202	.061133	.058962	.056717
0.7	.063736	.062442	.061076	.059558	.057885
0.8	.062219	.061452	.060642	.059663	.058484
0.9	.060699	.060338	.059970	.059440	.058687
1.0	.059203	.059159	.059150	.058995	.058609

$\gamma_1 = 1.0$ $\gamma_2 = 0.8$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.056763	.042780	.034004	.028113	.023920
0.2	.064798	.055673	.048320	.042453	.037736
0.3	.065931	.060129	.054813	.050077	.045912
0.4	.065103	.061398	.057722	.054168	.050805
0.5	.063567	.061241	.058801	.056267	.053696
0.6	.061766	.060387	.058876	.057178	.055317
0.7	.059887	.059181	.058375	.057356	.056106
0.8	.058016	.057802	.057539	.057070	.056340
0.9	.056195	.056347	.056507	.056486	.056195
1.0	.054443	.054872	.055367	.055710	.055791

$\gamma_1 = 1.0$ $\gamma_2 = 1.0$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.056454	.042660	.033949	.028084	.023904
0.2	.063810	.055112	.047991	.042254	.037611
0.3	.064280	.059013	.054062	.049569	.045565
0.4	.062881	.059737	.056503	.053280	.050158
0.5	.060869	.059091	.057125	.054978	.052711
0.6	.058676	.057812	.056779	.055499	.053984
0.7	.056477	.056244	.055903	.055312	.054434
0.8	.054346	.054560	.054738	.054693	.054347
0.9	.052314	.052850	.053423	.053811	.053905
1.0	.050392	.051164	.052039	.052772	.053230

$\gamma_1 = 1.0$ $\gamma_2 = 1.2$

Q_{12}

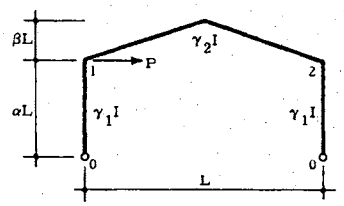
α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.056148	.042540	.033894	.028056	.023888
0.2	.062851	.054562	.047667	.042057	.037487
0.3	.062710	.057937	.053332	.049072	.045222
0.4	.060806	.058164	.055335	.052422	.049527
0.5	.058391	.057086	.055542	.053748	.051761
0.6	.055881	.055447	.054826	.053916	.052714
0.7	.053435	.053585	.053632	.053408	.052859
0.8	.051112	.051663	.052198	.052506	.052490
0.9	.048934	.049763	.050657	.051378	.051795
1.0	.046902	.047927	.049087	.050128	.050895

$\gamma_1 = 1.0$ $\gamma_2 = 1.4$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.055845	.042421	.033839	.028028	.023873
0.2	.061921	.054023	.047348	.041861	.037362
0.3	.061215	.056900	.052621	.048585	.044885
0.4	.058863	.056672	.054214	.051590	.048911
0.5	.056106	.055213	.054045	.052571	.050845
0.6	.053340	.053269	.053004	.052420	.051502
0.7	.050703	.051166	.051538	.051631	.051372
0.8	.048241	.049058	.049882	.050487	.050756
0.9	.045964	.047016	.048164	.049155	.049844
1.0	.043864	.045074	.046452	.047736	.048756

TABLE 1-1 MOMENT COEFFICIENTS ONE SPAN FRAME



$M_{12} = +Q_{12}PL$

$M_{21} = +Q_{21}PL$

$\gamma_1 = 1.0$ $\gamma_2 = 0.6$

α \ β	Q_{12} 0.1	0.2	0.3	0.4	0.5	Q_{21} 0.1	0.2	0.3	0.4	0.5
0.1	.067562	.076694	.081986	.085377	.087716	.032438	.023306	.018014	.014623	.012284
0.2	.120059	.134612	.145200	.153081	.159103	.079941	.065388	.054800	.046919	.040897
0.3	.170534	.187494	.201309	.212554	.221759	.129466	.112506	.098691	.087446	.078241
0.4	.220429	.238494	.254225	.267798	.279462	.179571	.161506	.145775	.132202	.120538
0.5	.270103	.288641	.305512	.320677	.334183	.229899	.211359	.194489	.179323	.165817
0.6	.319683	.338357	.355893	.372142	.387018	.280318	.261643	.244107	.227858	.212982
0.7	.369225	.387843	.405743	.422723	.438614	.330775	.312157	.294257	.277277	.261387
0.8	.418762	.437203	.455268	.472732	.489369	.381250	.362796	.344732	.327268	.310631
0.9	.468281	.486497	.504593	.522362	.539544	.431704	.413503	.395406	.377638	.360457
1.0	.517829	.535757	.553796	.571738	.589309	.482168	.464241	.446205	.428262	.410691

$\gamma_1 = 1.0$ $\gamma_2 = 0.8$

α \ β	Q_{12} 0.1	0.2	0.3	0.4	0.5	Q_{21} 0.1	0.2	0.3	0.4	0.5
0.1	.067466	.076619	.081934	.085341	.087692	.032534	.023381	.018166	.014659	.012308
0.2	.119748	.134260	.144890	.152831	.158906	.080252	.065740	.055110	.047169	.041094
0.3	.170007	.186785	.200596	.211913	.221211	.129993	.113215	.099404	.088087	.078789
0.4	.219706	.237424	.253055	.266669	.278437	.180293	.162576	.146945	.133331	.121563
0.5	.269212	.287235	.303883	.319020	.332610	.230789	.212765	.196117	.180980	.167390
0.6	.318647	.336648	.353829	.369959	.384870	.281354	.263351	.246171	.230041	.215130
0.7	.368064	.385867	.403277	.420035	.435891	.331935	.314133	.296722	.279965	.264108
0.8	.417492	.434993	.452440	.469571	.486092	.382513	.365007	.347559	.330429	.313908
0.9	.466924	.484082	.501441	.518765	.535741	.433061	.415917	.398559	.381235	.364260
1.0	.516402	.533167	.550355	.567743	.585014	.483610	.466833	.449646	.432257	.414986

$\gamma_1 = 1.0$ $\gamma_2 = 1.0$

α \ β	Q_{12} 0.1	0.2	0.3	0.4	0.5	Q_{21} 0.1	0.2	0.3	0.4	0.5
0.1	.067370	.076544	.081882	.085306	.087667	.032630	.023456	.018118	.014694	.012333
0.2	.119446	.133915	.144585	.152583	.158710	.080553	.066085	.055415	.047417	.041290
0.3	.169506	.186102	.199904	.211286	.220672	.130494	.113898	.100096	.088714	.079328
0.4	.219034	.236411	.251935	.265576	.277437	.180966	.163589	.148065	.134424	.122563
0.5	.268397	.285927	.302348	.317440	.331094	.231605	.214073	.197653	.182560	.168906
0.6	.317715	.335086	.351912	.367905	.382825	.282288	.264915	.248088	.232095	.217175
0.7	.367036	.384086	.401021	.417539	.433331	.332965	.315911	.298978	.282461	.266668
0.8	.416384	.433029	.449888	.466673	.483047	.383619	.366967	.350112	.333327	.316953
0.9	.465764	.481968	.498633	.515509	.532248	.434240	.418032	.401367	.384491	.367753
1.0	.515177	.530925	.547327	.564170	.581113	.484823	.469072	.452673	.435829	.418886

TABLE 1-1 (cont.) MOMENT COEFFICIENTS ONE SPAN FRAME

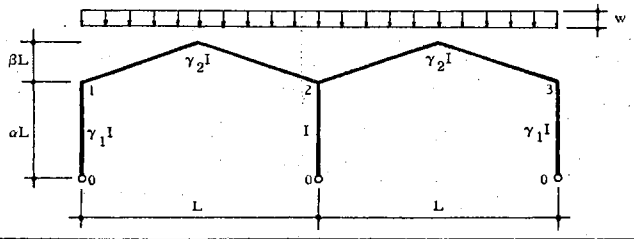
$\gamma_1 = 1.0$ $\gamma_2 = 1.2$

α \ β	Q_{12} 0.1	0.2	0.3	0.4	0.5	α \ β	Q_{21} 0.1	0.2	0.3	0.4	0.5
0.1	.067276	.076469	.081831	.085271	.087642	0.1	.032724	.023531	.018169	.014729	.012358
0.2	.119154	.133577	.144284	.152337	.158516	0.2	.080845	.066423	.055716	.047663	.041484
0.3	.169029	.185444	.199229	.210671	.220140	0.3	.130971	.114556	.100770	.089329	.079860
0.4	.218406	.235452	.250861	.264519	.276462	0.4	.181594	.164547	.149139	.135481	.123537
0.5	.267647	.284708	.300897	.315931	.329633	0.5	.232353	.215291	.199103	.184069	.170367
0.6	.316872	.333652	.350127	.365968	.380876	0.6	.283132	.266350	.249873	.234033	.219124
0.7	.366117	.382476	.398949	.415214	.430920	0.7	.333882	.317525	.301051	.284786	.269080
0.8	.415410	.431276	.447572	.464008	.480210	0.8	.384594	.368722	.352427	.335993	.319790
0.9	.464741	.480101	.496115	.512547	.529028	0.9	.435254	.419900	.403885	.387453	.370973
1.0	.514129	.528972	.544643	.560955	.577555	1.0	.485878	.471033	.455357	.439045	.422445

$\gamma_1 = 1.0$ $\gamma_2 = 1.4$

α \ β	Q_{12} 0.1	0.2	0.3	0.4	0.5	α \ β	Q_{21} 0.1	0.2	0.3	0.4	0.5
0.1	.067183	.076395	.081780	.085235	.087617	0.1	.032817	.023604	.018220	.014765	.012383
0.2	.118871	.133245	.143987	.152094	.158323	0.2	.081129	.066755	.056013	.047906	.041677
0.3	.168576	.184809	.198573	.210068	.219617	0.3	.131424	.115191	.101427	.089932	.080383
0.4	.217818	.234543	.249831	.263496	.275512	0.4	.182182	.165457	.150169	.136505	.124488
0.5	.266957	.283570	.299525	.314487	.328223	0.5	.233043	.216430	.200476	.185513	.171777
0.6	.316103	.332329	.348461	.364138	.379017	0.6	.283898	.267672	.251539	.235862	.220983
0.7	.365293	.381010	.397038	.413045	.428644	0.7	.334705	.318991	.302962	.286956	.271357
0.8	.414544	.429701	.445462	.461547	.477560	0.8	.385460	.370302	.354537	.338454	.322440
0.9	.463851	.478437	.493845	.509842	.526051	0.9	.436154	.421559	.406154	.390159	.373950
1.0	.513216	.527250	.542248	.558047	.574296	1.0	.486795	.472760	.457754	.441953	.425705

TABLE 2-0 MOMENT COEFFICIENTS TWO SPAN FRAME



$M_{12} = -Q_{12}\,wL^2$
$M_{21} = +Q_{21}\,wL^2$
$M_{23} = -Q_{21}\,wL^2$
$M_{32} = +Q_{12}\,wL^2$

$\gamma_1 = 0.8$ $\gamma_2 = 0.6$

Q_{12} α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.062157	.046073	.035705	.028912	.024208
0.2	.067863	.060190	.052293	.045541	.040024
0.3	.065656	.063003	.058673	.053943	.049392
0.4	.062052	.061966	.060234	.057557	.054438
0.5	.058356	.059598	.059557	.058508	.056749
0.6	.054890	.056828	.057862	.058005	.057377
0.7	.051727	.054023	.055735	.056726	.056986
0.8	.048864	.051333	.053468	.055053	.055991
0.9	.046277	.048811	.051206	.053203	.054650
1.0	.043935	.046473	.049020	.051300	.053125

Q_{21} α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.047304	.032854	.026811	.023807	.022115
0.2	.065620	.049763	.040025	.033917	.029942
0.3	.075758	.061997	.051658	.044086	.038564
0.4	.082339	.070779	.061002	.053054	.046746
0.5	.087069	.077322	.068421	.060642	.054063
0.6	.090694	.082379	.074371	.066995	.060451
0.7	.093594	.086412	.079218	.072326	.065979
0.8	.095987	.089709	.083228	.076828	.070759
0.9	.098005	.092459	.086596	.080664	.074904
1.0	.099737	.094793	.089461	.083960	.078516

$\gamma_1 = 0.8$ $\gamma_2 = 0.8$

Q_{12} α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.061408	.045812	.035596	.028860	.024181
0.2	.065537	.058874	.051553	.045114	.039767
0.3	.062060	.060457	.056954	.052799	.048628
0.4	.057569	.058383	.057518	.055559	.052987
0.5	.053275	.055232	.055983	.055681	.054560
0.6	.049418	.051699	.053606	.054453	.054483
0.7	.046009	.048703	.050961	.052576	.053467
0.8	.043003	.045751	.048313	.050428	.051941
0.9	.040345	.043063	.045779	.048212	.050164
1.0	.037984	.040629	.043406	.046032	.048288

Q_{21} α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.048240	.033377	.027111	.023990	.022232
0.2	.067655	.051408	.041227	.034773	.030553
0.3	.078455	.064543	.053807	.045801	.039902
0.4	.085422	.073915	.063888	.055551	.048831
0.5	.090371	.080815	.071816	.063751	.056800
0.6	.094114	.086076	.078095	.070547	.063706
0.7	.097066	.090212	.083139	.076179	.069623
0.8	.099467	.093546	.087256	.080875	.074682
0.9	.101465	.096292	.090666	.084824	.079016
1.0	.103159	.098591	.093531	.088175	.082748

$\gamma_1 = 0.8$ $\gamma_2 = 1.0$

Q_{12} α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.060677	.045553	.035488	.028808	.024153
0.2	.063365	.057614	.050834	.044694	.039513
0.3	.058838	.058109	.055333	.051703	.047887
0.4	.053689	.055192	.055036	.053696	.051612
0.5	.049008	.051462	.052814	.053115	.052533
0.6	.044938	.047756	.049934	.051311	.051868
0.7	.041430	.044337	.046941	.048992	.050357
0.8	.038398	.041263	.044065	.046520	.048438
0.9	.035761	.038526	.041392	.044076	.046358
1.0	.033453	.036091	.038946	.041744	.044258

Q_{21} α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.049153	.033893	.027409	.024171	.022349
0.2	.069556	.052983	.042395	.035612	.031157
0.3	.080872	.066891	.055834	.047446	.041198
0.4	.088089	.076707	.066524	.057880	.050807
0.5	.093145	.083831	.074827	.066573	.059333
0.6	.096913	.089183	.081308	.073689	.066649
0.7	.099846	.093331	.086441	.079507	.072844
0.8	.102201	.096631	.090575	.084295	.078076
0.9	.104139	.099316	.093956	.088270	.082505
1.0	.105764	.101541	.096764	.091604	.086274

TABLE 2-0 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 0.8$ $\gamma_2 = 1.2$

α \ β	Q_{12} 0.1	0.2	0.3	0.4	0.5	α \ β	Q_{21} 0.1	0.2	0.3	0.4	0.5
0.1	.059964	.045298	.035380	.028756	.024126	0.1	.050045	.034404	.027705	.024352	.022466
0.2	.061333	.056407	.050134	.044282	.039262	0.2	.071334	.054491	.043532	.036437	.031752
0.3	.055933	.055936	.053801	.050652	.047168	0.3	.083050	.069064	.057749	.049023	.042456
0.4	.050300	.052332	.052759	.051953	.050307	0.4	.090419	.079210	.068943	.060059	.052684
0.5	.045374	.048173	.049985	.050775	.050652	0.5	.095507	.086461	.077515	.069147	.061685
0.6	.041204	.044226	.046732	.048512	.049491	0.6	.099248	.091830	.084109	.076488	.069322
0.7	.037680	.040689	.043508	.045866	.047590	0.7	.102123	.095936	.089261	.082410	.075711
0.8	.034683	.037578	.040503	.043175	.045377	0.8	.104407	.099165	.093357	.087222	.081041
0.9	.032113	.034853	.037772	.040594	.043089	0.9	.106268	.101764	.096671	.091172	.085501
1.0	.029888	.032465	.035317	.038188	.040849	1.0	.107814	.103898	.099395	.094450	.089257

$\gamma_1 = 0.8$ $\gamma_2 = 1.4$

α \ β	Q_{12} 0.1	0.2	0.3	0.4	0.5	α \ β	Q_{21} 0.1	0.2	0.3	0.4	0.5
0.1	.059267	.045045	.035273	.028705	.024098	0.1	.050916	.034910	.027999	.024533	.022582
0.2	.059427	.055249	.049454	.043877	.039015	0.2	.073002	.055938	.044637	.037246	.032340
0.3	.053302	.053919	.052352	.049641	.046470	0.3	.085023	.071081	.059560	.050538	.043677
0.4	.047313	.049753	.050664	.050320	.049065	0.4	.092473	.081466	.071170	.062100	.054468
0.5	.042241	.045280	.047443	.048633	.048900	0.5	.097543	.088776	.079929	.071504	.063875
0.6	.038042	.041183	.043916	.046003	.047323	0.6	.101224	.094113	.086573	.078997	.071761
0.7	.034552	.037596	.040544	.043114	.045110	0.7	.104022	.098146	.091696	.084965	.078279
0.8	.031624	.034497	.037474	.040278	.042681	0.8	.106223	.101284	.095724	.089757	.083653
0.9	.029140	.031820	.034734	.037622	.040251	0.9	.108002	.103786	.098949	.093649	.088103
1.0	.027010	.029500	.032306	.035190	.037928	1.0	.109469	.105825	.101578	.096848	.091813

TABLE 2-0 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.0$ $\gamma_2 = 0.6$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.062615	.046231	.035771	.028944	.024225
0.2	.069339	.061008	.052747	.045802	.040180
0.3	.068021	.064637	.059756	.054653	.049862
0.4	.065094	.064335	.061990	.058826	.055347
0.5	.061898	.062565	.061929	.060346	.058149
0.6	.058796	.060261	.060755	.060367	.059266
0.7	.055895	.057813	.059054	.059546	.059329
0.8	.053216	.055387	.057125	.058259	.058739
0.9	.050754	.053061	.055127	.056728	.057749
1.0	.048493	.050862	.053144	.055083	.056522

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.046732	.032538	.026630	.023697	.022044
0.2	.064328	.048740	.039287	.033396	.029572
0.3	.073984	.060363	.050305	.043020	.037741
0.4	.080248	.068707	.059135	.051467	.045439
0.5	.084766	.074948	.066167	.058620	.052313
0.6	.088252	.079804	.071839	.064633	.058326
0.7	.091064	.083705	.076491	.069708	.063552
0.8	.093403	.086921	.080371	.074023	.068097
0.9	.095393	.089626	.083655	.077727	.072064
1.0	.097116	.091940	.086471	.080934	.075543

$\gamma_1 = 1.0$ $\gamma_2 = 0.8$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.062006	.046020	.035683	.028902	.024203
0.2	.067385	.059922	.052143	.045455	.039973
0.3	.064904	.062477	.058321	.053710	.049237
0.4	.061101	.061215	.059670	.057146	.054141
0.5	.057264	.058670	.058806	.057920	.056298
0.6	.053701	.055768	.056957	.057258	.056774
0.7	.050473	.052868	.054710	.055844	.056246
0.8	.047568	.050110	.052351	.054062	.055131
0.9	.044955	.047542	.050020	.052124	.053690
1.0	.042600	.045173	.047784	.050152	.052082

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.047493	.032959	.026871	.023844	.022138
0.2	.066038	.050098	.040268	.034090	.030065
0.3	.076322	.062523	.052098	.044435	.038835
0.4	.082993	.071437	.061600	.053567	.047172
0.5	.087779	.078064	.069134	.061288	.054628
0.6	.091437	.083174	.075162	.067742	.061129
0.7	.094356	.087237	.080060	.073144	.066746
0.8	.096757	.090549	.084101	.077696	.071592
0.9	.098776	.093305	.087485	.081563	.075784
1.0	.100505	.095638	.090357	.084878	.079429

$\gamma_1 = 1.0$ $\gamma_2 = 1.0$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.061408	.045812	.035596	.028860	.024181
0.2	.065537	.058874	.051553	.045114	.039767
0.3	.062060	.060457	.056954	.052799	.048628
0.4	.057569	.058383	.057518	.055559	.052988
0.5	.053275	.055232	.055983	.055681	.054560
0.6	.049418	.051899	.053606	.054453	.054483
0.7	.046009	.048703	.050961	.052576	.053467
0.8	.043003	.045751	.048313	.050428	.051941
0.9	.040345	.043063	.045779	.048212	.050164
1.0	.037984	.040629	.043406	.046032	.048288

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.048240	.033377	.027111	.023990	.022232
0.2	.067655	.051408	.041227	.034773	.030553
0.3	.078455	.064543	.053807	.045801	.039902
0.4	.085422	.073915	.063888	.055551	.048831
0.5	.090371	.080815	.071816	.063751	.056800
0.6	.094114	.086076	.078095	.070547	.063706
0.7	.097066	.090212	.083139	.076179	.069623
0.8	.099467	.093546	.087255	.080875	.074682
0.9	.101465	.096292	.090666	.084824	.079016
1.0	.103159	.098591	.093531	.088175	.082748

TABLE 2-0 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.0$ $\gamma_2 = 1.2$

α \ β	Q_{12} 0.1	0.2	0.3	0.4	0.5	Q_{21} 0.1	0.2	0.3	0.4	0.5
0.1	.060822	.045605	.035509	.028819	.024159	.048972	.033791	.027349	.024135	.022325
0.2	.063788	.057861	.050976	.044777	.039564	.069186	.052673	.042164	.035446	.031037
0.3	.059455	.058563	.055650	.051918	.048033	.080409	.066437	.055438	.047122	.040942
0.4	.054423	.055802	.055515	.054058	.051881	.087584	.076173	.066015	.057427	.050420
0.5	.049806	.052174	.053419	.053609	.052927	.092626	.083261	.074252	.066030	.058842
0.6	.045768	.048531	.050627	.051910	.052371	.096395	.088602	.080701	.083090	.066083
0.7	.042271	.045146	.047693	.049669	.050950	.099335	.092753	.085823	.078878	.072230
0.8	.039238	.042089	.044853	.047253	.049100	.101702	.096064	.089958	.083654	.077434
0.9	.036593	.039355	.042200	.044845	.047072	.103654	.098763	.093350	.087629	.081850
1.0	.034271	.036915	.039763	.042537	.045009	.105294	.101005	.096172	.090971	.085617

$\gamma_1 = 1.0$ $\gamma_2 = 1.4$

α \ β	Q_{12} 0.1	0.2	0.3	0.4	0.5	Q_{21} 0.1	0.2	0.3	0.4	0.5
0.1	.060247	.045400	.035423	.028777	.024137	.049691	.034201	.027587	.024280	.022419
0.2	.062130	.056884	.050412	.044446	.039362	.070636	.053896	.043081	.036109	.031515
0.3	.057060	.056785	.054403	.051067	.047453	.082205	.068215	.056996	.048400	.041958
0.4	.051603	.053439	.053647	.052636	.050821	.089523	.078240	.068000	.059204	.051945
0.5	.046761	.049437	.051079	.051686	.051388	.094605	.085450	.076475	.068145	.060765
0.6	.042620	.045574	.047962	.049594	.050415	.098362	.090820	.083033	.075406	.068283
0.7	.039095	.042074	.044819	.047067	.048659	.101264	.094947	.088184	.081295	.074603
0.8	.036079	.038970	.041856	.044453	.046554	.103578	.098208	.092300	.086103	.079901
0.9	.033479	.036235	.039141	.041919	.044340	.105470	.100843	.095644	.090068	.084355
1.0	.031219	.033824	.036684	.039535	.042148	.107049	.103014	.098404	.093372	.088121

TABLE 2-0 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.2$ $\gamma_2 = 0.6$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.062924	.046337	.035815	.028965	.024236
0.2	.070360	.061566	.053054	.045977	.040285
0.3	.069694	.065774	.060500	.055137	.050180
0.4	.067293	.066018	.063219	.059704	.055970
0.5	.064508	.064713	.063618	.061637	.059122
0.6	.061724	.062791	.062851	.062052	.060596
0.7	.059067	.060648	.061495	.061587	.061001
0.8	.056575	.058467	.059855	.060612	.060725
0.9	.054254	.056330	.058093	.059349	.060018
1.0	.052097	.054279	.056302	.057930	.059039

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.046345	.032326	.026510	.023624	.021997
0.2	.063435	.048043	.038788	.033045	.029324
0.3	.072729	.059226	.049375	.042294	.037184
0.4	.078736	.067234	.057830	.050370	.044543
0.5	.083070	.073229	.064563	.057200	.051098
0.6	.086422	.077907	.070005	.062948	.056830
0.7	.089138	.081680	.074486	.067812	.061821
0.8	.091409	.084804	.078239	.071964	.066172
0.9	.093352	.087446	.081430	.075543	.069984
1.0	.095045	.089718	.084181	.078656	.073341

$\gamma_1 = 1.2$ $\gamma_2 = 0.8$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.062410	.046161	.035742	.028930	.024218
0.2	.068675	.060641	.052544	.045686	.040111
0.3	.066949	.063900	.059270	.054335	.049652
0.4	.063706	.063260	.061197	.058255	.054939
0.5	.060272	.061210	.060852	.059515	.057519
0.6	.056994	.058685	.059434	.059294	.058411
0.7	.053962	.056065	.057531	.058259	.058264
0.8	.051190	.053509	.055440	.056789	.057485
0.9	.048662	.051084	.053313	.055105	.056329
1.0	.046356	.048813	.051228	.053335	.054960

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.046987	.032679	.026711	.023746	.022075
0.2	.064909	.049198	.039616	.033628	.029737
0.3	.074788	.061100	.050913	.043497	.038109
0.4	.081202	.069647	.059978	.052181	.046025
0.5	.085823	.076032	.067191	.059534	.053101
0.6	.089379	.080986	.072995	.065706	.059287
0.7	.092237	.084954	.077742	.070903	.064655
0.8	.094606	.088212	.081688	.075309	.069312
0.9	.096614	.090944	.085016	.079079	.073365
1.0	.098345	.093272	.087859	.082332	.076910

$\gamma_1 = 1.2$ $\gamma_2 = 1.0$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.061905	.045985	.035669	.028895	.024199
0.2	.067069	.059744	.052044	.045398	.039938
0.3	.064412	.062131	.058089	.053556	.049134
0.4	.060482	.060724	.059300	.056875	.053946
0.5	.056558	.058068	.058316	.057534	.056000
0.6	.052936	.055084	.056370	.056770	.056379
0.7	.049669	.052125	.054047	.055272	.055763
0.8	.046741	.049327	.051632	.053420	.054573
0.9	.044115	.046732	.049259	.051428	.053068
1.0	.041755	.044346	.046994	.049415	.051408

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.047618	.033029	.026911	.023868	.022154
0.2	.066314	.050319	.040429	.034204	.030147
0.3	.076691	.062869	.052389	.044666	.039015
0.4	.083419	.071866	.061993	.053906	.047453
0.5	.088237	.078546	.069600	.061712	.055000
0.6	.091915	.083687	.075676	.068230	.061574
0.7	.094844	.087768	.080604	.073676	.067246
0.8	.097248	.091088	.084663	.078257	.072133
0.9	.099266	.093846	.088056	.082143	.076354
1.0	.100991	.096175	.090930	.085468	.080018

TABLE 2-0 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

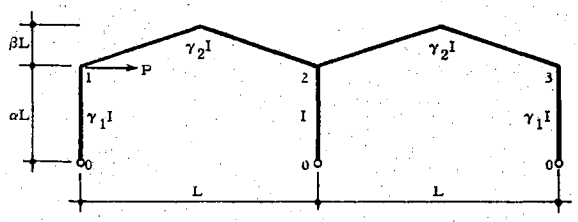
$\gamma_1 = 1.2$ $\gamma_2 = 1.2$

α \ β	Q_{12} 0.1	0.2	0.3	0.4	0.5	α \ β	Q_{21} 0.1	0.2	0.3	0.4	0.5
0.1	.061408	.045812	.035596	.028860	.024181	0.1	.048240	.033377	.027111	.023990	.022232
0.2	.065537	.058674	.051553	.045114	.039767	0.2	.067655	.051408	.041227	.034773	.030553
0.3	.062060	.060457	.056954	.052799	.048628	0.3	.078455	.064543	.053807	.045801	.039902
0.4	.057568	.058383	.057518	.055559	.052987	0.4	.085422	.073915	.063888	.055551	.048831
0.5	.053275	.055232	.055983	.055681	.054560	0.5	.090371	.080815	.071816	.063751	.056800
0.6	.049418	.051899	.053606	.054453	.054483	0.6	.094114	.086076	.078095	.070547	.063706
0.7	.046009	.048703	.050961	.052576	.053467	0.7	.097066	.090212	.083139	.076179	.069623
0.8	.043003	.045751	.048313	.050428	.051941	0.8	.099467	.093546	.087256	.080875	.074682
0.9	.040345	.043063	.045779	.048212	.050164	0.9	.101465	.096292	.090666	.084824	.079016
1.0	.037984	.040629	.043406	.046032	.048288	1.0	.103159	.098591	.093531	.088175	.082748

$\gamma_1 = 1.2$ $\gamma_2 = 1.4$

α \ β	Q_{12} 0.1	0.2	0.3	0.4	0.5	α \ β	Q_{21} 0.1	0.2	0.3	0.4	0.5
0.1	.060919	.045639	.035524	.028825	.024162	0.1	.048851	.033722	.027310	.024111	.022310
0.2	.064073	.058028	.051071	.044833	.039597	0.2	.068936	.052465	.042009	.035334	.030956
0.3	.059874	.058871	.055863	.052063	.048131	0.3	.080095	.066129	.055171	.046905	.040771
0.4	.054923	.056216	.055839	.054303	.052063	0.4	.087240	.075811	.065671	.057121	.050160
0.5	.050352	.052660	.053830	.053944	.053192	0.5	.092271	.082872	.073862	.065662	.058510
0.6	.046339	.049062	.051101	.052317	.052711	0.6	.096038	.088204	.080287	.072683	.065700
0.7	.042852	.045703	.048209	.050131	.051353	0.7	.098983	.092355	.085400	.078449	.071813
0.8	.039819	.042658	.045395	.047754	.049552	0.8	.101357	.095673	.089535	.083215	.076997
0.9	.037169	.039928	.042757	.045373	.047561	0.9	.103318	.098381	.092932	.087189	.081402
1.0	.034839	.037486	.040327	.043082	.045524	1.0	.104968	.100634	.095763	.090534	.085166

TABLE 2-1 MOMENT COEFFICIENTS TWO SPAN FRAME



$M_{12} = +Q_{12}PL$
$M_{21} = +Q_{21}PL$
$M_{20} = -Q_{20}PL$
$M_{23} = +Q_{23}PL$
$M_{32} = +Q_{32}PL$

$\gamma_1 = 0.8$ $\gamma_2 = 0.6$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.054046	.069071	.077141	.082004	.085209
0.2	.082092	.106670	.124464	.137293	.146738
0.3	.107420	.134985	.158358	.177434	.192814
0.4	.132650	.160566	.186500	.209527	.229434
0.5	.158240	.185464	.212241	.237456	.260444
0.6	.184267	.210389	.237077	.263297	.288202
0.7	.210711	.235596	.261697	.288166	.314126
0.8	.237538	.261166	.286424	.312666	.339072
0.9	.264700	.287111	.311403	.337126	.363554
1.0	.292167	.313418	.336695	.361723	.387885

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.003907	-.001925	-.004074	-.005061	-.005591
0.2	.020702	.006358	-.001069	-.005127	-.007493
0.3	.040985	.020659	.007856	-.000193	-.005350
0.4	.062311	.038019	.020795	.008827	.000534
0.5	.083948	.056967	.036316	.020905	.009546
0.6	.105630	.076766	.053489	.035194	.021043
0.7	.127248	.097029	.071736	.051070	.034469
0.8	.148761	.117542	.090688	.068086	.049375
0.9	.170148	.138179	.110107	.085925	.065417
1.0	.191411	.158870	.129836	.104362	.082330

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032311	.023288	.018020	.014633	.012293
0.2	.078797	.064908	.054611	.046858	.040892
0.3	.126194	.110674	.097696	.086924	.077982
0.4	.173172	.157359	.143165	.130595	.119568
0.5	.219505	.203996	.189421	.175908	.163547
0.6	.265187	.250256	.235783	.221897	.208768
0.7	.310261	.296037	.281944	.268061	.254578
0.8	.354791	.341322	.327770	.314137	.300596
0.9	.398828	.386127	.373206	.359985	.346601
1.0	.442435	.430484	.418240	.405537	.392460

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.028404	.025214	.022094	.019694	.017884
0.2	.058095	.058550	.055680	.051985	.048385
0.3	.085209	.090015	.089840	.087117	.083332
0.4	.110861	.119340	.122370	.121768	.119034
0.5	.135557	.147029	.153107	.155003	.154001
0.6	.159557	.173490	.182294	.186703	.187725
0.7	.183013	.199008	.210208	.216991	.220109
0.8	.206030	.223780	.237082	.246051	.251221
0.9	.228680	.247948	.263099	.274060	.281184
1.0	.251024	.271614	.288404	.301175	.310130

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.013644	.007641	.004839	.003363	.002497
0.2	.039112	.028423	.020925	.015849	.012371
0.3	.066385	.054341	.043945	.035641	.029204
0.4	.094178	.082075	.070335	.059879	.050999
0.5	.122254	.110541	.098338	.086636	.076009
0.6	.150549	.139355	.127140	.114806	.103030
0.7	.179029	.168366	.156358	.143773	.131296
0.8	.207676	.197513	.185807	.173197	.160332
0.9	.236471	.226763	.215392	.202889	.189845
1.0	.265406	.256102	.245066	.232740	.219655

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 0.8$ $\gamma_2 = 0.8$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.053775	.068862	.077004	.081914	.085148
0.2	.081378	.105717	.123610	.136609	.146209
0.3	.106508	.133286	.156489	.175700	.191321
0.4	.131770	.158371	.183704	.206628	.226708
0.5	.157556	.183036	.208759	.233518	.256469
0.6	.183887	.207943	.233172	.258549	.283117
0.7	.210709	.233291	.257598	.282853	.308142
0.8	.237956	.259118	.282313	.307013	.332414
0.9	.265566	.285401	.307424	.331325	.356438
1.0	.293497	.312100	.332955	.355930	.380500

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.003630	-.002239	-.004350	-.005290	-.005777
0.2	.020035	.005385	-.002137	-.006154	-.008422
0.3	.039930	.019098	.005954	-.002217	-.007338
0.4	.060845	.035959	.018190	.005883	-.002535
0.5	.082048	.054455	.033132	.017192	.005516
0.6	.103278	.073821	.049814	.030851	.016206
0.7	.124436	.093658	.067620	.046198	.028962
0.8	.145485	.113748	.086159	.062754	.043308
0.9	.166411	.133966	.105182	.080180	.058867
1.0	.187223	.154242	.124525	.098232	.075355

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032365	.023358	.018074	.014672	.012321
0.2	.078751	.065101	.054855	.047086	.041085
0.3	.125770	.110812	.098082	.087386	.078437
0.4	.172152	.157210	.143520	.131199	.120264
0.5	.217741	.203362	.189549	.176498	.164382
0.6	.262583	.248987	.235508	.222303	.209600
0.7	.306762	.294025	.281122	.268126	.255257
0.8	.350366	.338495	.326290	.313726	.300984
0.9	.393466	.382439	.370988	.358992	.346573
1.0	.436143	.425912	.415227	.403875	.391913

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.028735	.025597	.022424	.019962	.018098
0.2	.058716	.059716	.056992	.053240	.049507
0.3	.085840	.091714	.092128	.089603	.085775
0.4	.111307	.121251	.125330	.125316	.122799
0.5	.135693	.148907	.156417	.159306	.158866
0.6	.159305	.175166	.185694	.191452	.193394
0.7	.182326	.200367	.213502	.221928	.226295
0.8	.204881	.224747	.240131	.250972	.257676
0.9	.227055	.248473	.265806	.278812	.287706
1.0	.248920	.271670	.290702	.305643	.316558

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.013860	.007780	.004922	.003414	.002531
0.2	.039871	.029182	.021535	.016306	.012706
0.3	.067721	.055901	.045429	.036914	.030242
0.4	.096077	.084418	.072777	.062173	.053028
0.5	.124703	.113602	.101691	.089984	.079149
0.6	.153530	.143070	.131320	.119149	.107284
0.7	.182528	.172683	.161281	.149022	.136601
0.8	.211677	.202387	.191397	.179261	.166602
0.9	.240956	.232159	.221589	.209683	.196989
1.0	.270361	.261991	.251819	.240194	.227588

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 0.8$ $\gamma_2 = 1.0$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.053511	.068656	.076868	.081824	.085087
0.2	.080712	.104805	.122778	.135937	.145687
0.3	.105697	.131718	.154724	.174036	.189872
0.4	.131026	.156418	.181144	.203918	.224120
0.5	.157015	.180951	.205670	.229936	.252782
0.6	.183630	.205911	.229806	.254342	.278510
0.7	.210781	.231440	.254160	.278262	.302844
0.8	.238382	.257530	.278954	.302243	.326649
0.9	.266355	.284129	.304252	.326538	.350402
1.0	.294642	.311173	.330045	.351250	.374357

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.003359	-.002549	-.004625	-.005518	-.005963
0.2	.019411	.004456	-.003174	-.007162	-.009339
0.3	.038979	.017661	.004162	-.004155	-.009263
0.4	.059560	.034122	.015813	.003142	-.005440
0.5	.080418	.052275	.030312	.013829	.001793
0.6	.101300	.071322	.046638	.027015	.011843
0.7	.122110	.090853	.064138	.041992	.024105
0.8	.142819	.110642	.082398	.058243	.038064
0.9	.163414	.130566	.101156	.075402	.053311
1.0	.183899	.150550	.120244	.093212	.069534

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032418	.023426	.018127	.014710	.012349
0.2	.078708	.065289	.055094	.047310	.041277
0.3	.125379	.110943	.098451	.087833	.078881
0.4	.171235	.157074	.143852	.131772	.120933
0.5	.216192	.202794	.189667	.177047	.165169
0.6	.260347	.247873	.235261	.222673	.210371
0.7	.303814	.292295	.280400	.268183	.255876
0.8	.346706	.336106	.325013	.313365	.301331
0.9	.389102	.379377	.369105	.358131	.346548
1.0	.431082	.422168	.412709	.402458	.391437

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.029059	.025975	.022752	.020228	.018312
0.2	.059297	.060833	.058268	.054472	.050616
0.3	.086399	.093282	.094289	.091988	.088144
0.4	.111675	.122952	.128039	.128630	.126373
0.5	.135774	.150519	.159355	.163218	.163376
0.6	.159047	.176551	.188623	.195658	.198528
0.7	.181704	.201442	.216262	.226191	.231771
0.8	.203887	.225464	.242615	.255122	.263267
0.9	.225688	.248811	.267949	.282729	.293237
1.0	.247183	.271618	.292465	.309246	.321903

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.014071	.007918	.005005	.003466	.002564
0.2	.040580	.029907	.022128	.016753	.013036
0.3	.068924	.057339	.046825	.038131	.031247
0.4	.097739	.086508	.075004	.064309	.054947
0.5	.126793	.116256	.104663	.093017	.082049
0.6	.156025	.146216	.134933	.122985	.111119
0.7	.185405	.176265	.165441	.153555	.141280
0.8	.214917	.206363	.196033	.184392	.172020
0.9	.244541	.236497	.226642	.215331	.203049
1.0	.274265	.266661	.257247	.246292	.234207

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 0.8$ $\gamma_2 = 1.2$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.053253	.068452	.076732	.081734	.085027
0.2	.080089	.103929	.121970	.135277	.145172
0.3	.104972	.130266	.153054	.172437	.188464
0.4	.130390	.154669	.178793	.201380	.221659
0.5	.156579	.179142	.202911	.226664	.249352
0.6	.183453	.204198	.226876	.250590	.274318
0.7	.210891	.229923	.251236	.274257	.298120
0.8	.238787	.256266	.276159	.298166	.321607
0.9	.267058	.283151	.301667	.322521	.345218
1.0	.295636	.310495	.327721	.347390	.369168

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.003095	-.002856	-.004898	-.005745	-.006149
0.2	.018828	.003566	-.004182	-.008150	-.010244
0.3	.038117	.016332	.002473	-.006012	-.011129
0.4	.058423	.032475	.013637	.000583	-.008195
0.5	.079004	.050365	.027796	.010767	-.001657
0.6	.099611	.069175	.043865	.023602	.007887
0.7	.120154	.088479	.061153	.038322	.019790
0.8	.140601	.108048	.079222	.054374	.033488
0.9	.160950	.127758	.097803	.071365	.048539
1.0	.181202	.147534	.116718	.089024	.064602

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032470	.023494	.018180	.014749	.012377
0.2	.078667	.065471	.055328	.047531	.041466
0.3	.125015	.111066	.098805	.088266	.079315
0.4	.170405	.156949	.144164	.132318	.121576
0.5	.214822	.202281	.189775	.177559	.165913
0.6	.258403	.246888	.235038	.223012	.211087
0.7	.301296	.290789	.279759	.268235	.256443
0.8	.343618	.334060	.323899	.313045	.301644
0.9	.385474	.376787	.367489	.357378	.346527
1.0	.426938	.419043	.410574	.401236	.391018

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.029375	.026350	.023078	.020494	.018526
0.2	.059839	.061905	.059510	.055681	.051710
0.3	.086898	.094734	.096332	.094278	.090444
0.4	.111982	.124474	.130527	.131735	.129771
0.5	.135818	.151916	.161979	.166792	.167570
0.6	.158792	.177713	.191173	.199410	.203200
0.7	.181142	.202310	.218606	.229913	.236653
0.8	.203017	.226012	.244677	.258671	.268156
0.9	.224524	.249029	.269686	.286013	.297988
1.0	.245736	.271509	.293856	.312212	.326416

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.014277	.008055	.005088	.003517	.002597
0.2	.041245	.030600	.022703	.017192	.013362
0.3	.070013	.058668	.048141	.039297	.032221
0.4	.099204	.088382	.077043	.066302	.056765
0.5	.128599	.118579	.107315	.095777	.084734
0.6	.158142	.148915	.138085	.126398	.114595
0.7	.187812	.179287	.169005	.157508	.145437
0.8	.217592	.209669	.199940	.188790	.176749
0.9	.247469	.240059	.230845	.220100	.208256
1.0	.277432	.270456	.261706	.251375	.239813

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 0.8$ $\gamma_2 = 1.4$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.053001	.068250	.076597	.081645	.084966
0.2	.079505	.103089	.121181	.134628	.144662
0.3	.104318	.128917	.151471	.170900	.187097
0.4	.129842	.153094	.176626	.198997	.219316
0.5	.156225	.177554	.200430	.223663	.246154
0.6	.183334	.202735	.224302	.247222	.270485
0.7	.211020	.228659	.248719	.270732	.293883
0.8	.239172	.255242	.273798	.294639	.317161
0.9	.267687	.282382	.299522	.319104	.340718
1.0	.296493	.309986	.325824	.344154	.364727

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.002838	-.003159	-.005170	-.005971	-.006334
0.2	.018279	.002714	-.005163	-.009120	-.011137
0.3	.037331	.015100	.000876	-.007793	-.012939
0.4	.057409	.030988	.011636	-.001812	-.010810
0.5	.077766	.048677	.025536	.007969	-.004862
0.6	.098153	.067309	.041424	.020545	.004286
0.7	.118482	.086444	.058567	.035094	.015930
0.8	.138733	.105850	.076508	.051020	.029460
0.9	.158893	.125400	.094965	.067908	.044393
1.0	.178962	.145023	.113760	.085475	.060370

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032522	.023561	.018233	.014787	.012404
0.2	.078627	.065647	.055556	.047749	.041653
0.3	.124677	.111183	.099144	.088685	.079739
0.4	.169651	.156832	.144456	.132837	.122193
0.5	.213599	.201816	.189874	.178038	.166618
0.6	.256700	.246009	.234837	.223323	.211755
0.7	.299116	.289469	.279190	.268282	.256963
0.8	.340992	.332292	.322922	.312758	.301928
0.9	.382416	.374573	.366085	.356715	.346507
1.0	.423464	.416397	.408740	.400169	.390649

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.029684	.026720	.023403	.020758	.018738
0.2	.060348	.062933	.060719	.056869	.052790
0.3	.087346	.096083	.098268	.096478	.092678
0.4	.112242	.125844	.132820	.134649	.133003
0.5	.135833	.153139	.164338	.170069	.171480
0.6	.158547	.178700	.193413	.202778	.207469
0.7	.180634	.203025	.220623	.233188	.241033
0.8	.202259	.226442	.246414	.261738	.272468
0.9	.223523	.249173	.271120	.288807	.302114
1.0	.244502	.271374	.294980	.314694	.330279

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.014478	.008189	.005170	.003568	.002630
0.2	.041868	.031264	.023262	.017623	.013684
0.3	.071004	.059900	.049385	.040414	.033164
0.4	.100508	.090073	.078917	.068166	.058490
0.5	.130176	.120631	.109696	.098299	.087228
0.6	.159966	.151257	.140861	.129455	.117760
0.7	.189857	.181873	.172092	.160986	.149154
0.8	.219846	.212466	.203279	.192602	.180911
0.9	.249912	.243040	.234395	.224181	.212776
1.0	.280041	.273602	.265436	.255677	.244623

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.0$ $\gamma_2 = 0.6$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.054264	.069217	.077233	.082063	.085248
0.2	.082909	.107458	.125099	.137778	.147091
0.3	.108986	.136696	.159937	.178775	.193910
0.4	.135070	.163313	.189222	.212011	.231598
0.5	.161614	.189312	.216193	.241232	.263888
0.6	.188687	.215393	.242302	.268434	.293039
0.7	.216270	.241808	.268225	.294694	.320411
0.8	.244320	.268642	.294282	.320601	.346829
0.9	.272786	.295907	.320622	.346483	.372795
1.0	.301632	.323592	.347311	.372517	.398613

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.004023	-.001755	-.003916	-.004928	-.005481
0.2	.020762	.006766	-.000524	-.004567	-.006971
0.3	.040713	.021039	.008652	.000800	-.004304
0.4	.061482	.038085	.021567	.010055	.002001
0.5	.082377	.056475	.036786	.022103	.011221
0.6	.103159	.075518	.053419	.036105	.022683
0.7	.123740	.094858	.070922	.051464	.035834
0.8	.144095	.114308	.088960	.067764	.050253
0.9	.164219	.133762	.107320	.084718	.065616
1.0	.184127	.153163	.125869	.102128	.081687

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032172	.023207	.017970	.014601	.012272
0.2	.078098	.064394	.054240	.046588	.040693
0.3	.124542	.109344	.096650	.086110	.077349
0.4	.170218	.154865	.141110	.128925	.118219
0.5	.214944	.200028	.186054	.173093	.161210
0.6	.258744	.244541	.230831	.217671	.205190
0.7	.301694	.288328	.275162	.262183	.249524
0.8	.343881	.331398	.318936	.306386	.293853
0.9	.385378	.373788	.362118	.350163	.337970
1.0	.426270	.415551	.404718	.393461	.381760

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.028149	.024962	.021886	.019529	.017753
0.2	.057336	.057628	.054764	.051155	.047664
0.3	.083829	.088305	.087998	.085310	.081653
0.4	.108736	.116780	.119543	.118870	.116218
0.5	.132567	.143553	.149268	.150990	.149989
0.6	.155585	.169023	.177413	.181566	.182507
0.7	.177954	.193470	.204240	.210719	.213690
0.8	.199786	.217090	.229976	.238622	.243600
0.9	.221159	.240026	.254798	.265445	.272354
1.0	.242143	.262388	.278849	.291333	.300073

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.013564	.007576	.004797	.003336	.002480
0.2	.038994	.028148	.020661	.015637	.012208
0.3	.066473	.053961	.043413	.035115	.028742
0.4	.094711	.081822	.069669	.059063	.050183
0.5	.123443	.110659	.097753	.085675	.074902
0.6	.152570	.140066	.126867	.113895	.101772
0.7	.182035	.169863	.156613	.143123	.130064
0.8	.211799	.199961	.186783	.173012	.159318
0.9	.241826	.230305	.217259	.203354	.189236
1.0	.272095	.260862	.247973	.234023	.219626

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.0$ $\gamma_2 = 0.8$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.054061	.069055	.077126	.081992	.085200
0.2	.082418	.106735	.124439	.137243	.146686
0.3	.108461	.135441	.158504	.177431	.192747
0.4	.134744	.161762	.187105	.209774	.229480
0.5	.161659	.187713	.213609	.238213	.260805
0.6	.189222	.213951	.239489	.264832	.289110
0.7	.217372	.240682	.265394	.290728	.315817
0.8	.246041	.267947	.291609	.316476	.341768
0.9	.275154	.295729	.318246	.342376	.367458
1.0	.304667	.323985	.345337	.368578	.393176

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.003781	-.002015	-.004141	-.005113	-.005632
0.2	.020091	.005900	-.001433	-.005422	-.007734
0.3	.039533	.019529	.006938	-.000955	-.005988
0.4	.059719	.035930	.019070	.007378	-.000696
0.5	.079974	.053668	.033546	.018556	.007534
0.6	.100082	.072046	.049466	.031747	.018068
0.7	.119970	.090711	.066275	.046345	.030360
0.8	.139625	.109480	.083630	.061921	.043977
0.9	.159049	.128254	.101318	.078178	.058588
1.0	.178269	.146979	.119200	.094909	.073942

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032182	.023250	.018007	.014629	.012292
0.2	.077840	.064428	.054365	.046728	.040822
0.3	.123642	.109088	.096718	.086319	.077604
0.4	.168393	.154014	.140868	.129032	.118504
0.5	.211996	.198331	.185248	.172878	.161358
0.6	.254547	.241809	.229241	.216915	.205007
0.7	.296170	.284428	.272613	.260694	.248821
0.8	.336990	.326242	.315296	.304005	.292459
0.9	.377103	.367322	.357295	.346762	.335741
1.0	.416619	.407745	.398644	.388941	.378574

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.028401	.025265	.022148	.019742	.017924
0.2	.057749	.058528	.055798	.052150	.048556
0.3	.084109	.089559	.089780	.087274	.083592
0.4	.108674	.118084	.121798	.121654	.119200
0.5	.132022	.144663	.151702	.154322	.153824
0.6	.154465	.169763	.179775	.185168	.186939
0.7	.176200	.193717	.206338	.214349	.218461
0.8	.197365	.216762	.231666	.242084	.248482
0.9	.218054	.239068	.255977	.268584	.277153
1.0	.238350	.260766	.279444	.294032	.304632

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.013757	.007695	.004867	.003379	.002507
0.2	.039741	.028837	.021196	.016129	.012492
0.3	.067896	.055471	.044778	.036250	.029649
0.4	.096862	.084223	.072027	.061194	.052016
0.5	.126346	.113956	.101142	.088909	.077837
0.6	.156234	.144241	.131270	.118253	.105884
0.7	.186458	.174890	.161993	.148579	.135362
0.8	.216972	.205811	.193094	.179520	.165772
0.9	.247731	.236950	.224459	.210863	.196802
1.0	.278719	.268272	.256019	.242481	.228251

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.0$ $\gamma_2 = 1.0$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.053862	.068895	.077019	.081921	.085152
0.2	.081956	.106037	.123793	.136718	.146277
0.3	.107990	.134269	.157139	.176132	.191612
0.4	.134477	.160362	.185143	.207660	.227451
0.5	.161734	.186318	.211281	.235429	.257911
0.6	.189725	.212741	.237023	.261589	.285499
0.7	.218354	.239782	.262980	.287240	.311682
0.8	.247527	.267441	.289392	.312930	.337305
0.9	.277158	.295672	.316334	.338925	.362846
1.0	.307179	.324408	.343806	.365341	.388566

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.003543	-.002272	-.004365	-.005297	-.005781
0.2	.019456	.005065	-.002320	-.006263	-.008490
0.3	.038449	.018116	.005305	-.002649	-.007629
0.4	.058139	.033968	.016751	.004851	-.003278
0.5	.077871	.051172	.030611	.015282	.004074
0.6	.097440	.069023	.045963	.027810	.013824
0.7	.116790	.087168	.062237	.041810	.025422
0.8	.135915	.105424	.079080	.056837	.038417
0.9	.154826	.123696	.096271	.072580	.052460
1.0	.173541	.141932	.113674	.088822	.067289

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032191	.023292	.018144	.014657	.012313
0.2	.077594	.064461	.054489	.046867	.040950
0.3	.122807	.108846	.096783	.086522	.077854
0.4	.166739	.153228	.140642	.129134	.118778
0.5	.209387	.196797	.184507	.172676	.161498
0.6	.250908	.239392	.227807	.216220	.204836
0.7	.291470	.281045	.270357	.259350	.248177
0.8	.331227	.321845	.312131	.301892	.291203
0.9	.370296	.361898	.353166	.343792	.333758
1.0	.408779	.401293	.393524	.385055	.375780

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.028648	.025564	.022409	.019954	.018094
0.2	.058138	.059396	.056809	.053130	.049440
0.3	.084358	.090730	.091478	.089171	.085483
0.4	.108600	.119260	.123891	.124283	.122056
0.5	.131516	.145625	.153896	.157394	.157424
0.6	.153468	.170369	.181844	.188410	.191012
0.7	.174680	.193877	.208120	.217540	.222755
0.8	.195312	.216421	.233051	.245055	.252786
0.9	.215470	.238202	.256895	.271212	.281298
1.0	.235238	.259361	.279850	.296233	.308491

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.013947	.007813	.004937	.003422	.002535
0.2	.040450	.029502	.021718	.016415	.012773
0.3	.069203	.056884	.046078	.037346	.030534
0.4	.098784	.086410	.074216	.063206	.053770
0.5	.128881	.116884	.104213	.091895	.080591
0.6	.159368	.147868	.135171	.122190	.109665
0.7	.190173	.179173	.166663	.153410	.140141
0.8	.221247	.210710	.198476	.185178	.171493
0.9	.252547	.242431	.230499	.217284	.203396
1.0	.284043	.274300	.262670	.249605	.235654

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.0$ $\gamma_2 = 1.2$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.053667	.068736	.076912	.081851	.085104
0.2	.081520	.105363	.123161	.136201	.145872
0.3	.107566	.133172	.155835	.174876	.190506
0.4	.134254	.159091	.183318	.205661	.225506
0.5	.161827	.185092	.209171	.232853	.255191
0.6	.190196	.211713	.234843	.258654	.282169
0.7	.219232	.239051	.260897	.284149	.307940
0.8	.248822	.267067	.287527	.309851	.333341
0.9	.278865	.295687	.314766	.335986	.358820
1.0	.309294	.324830	.342589	.362637	.384609

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.003309	-.002527	-.004588	-.005481	-.005931
0.2	.018854	.004259	-.003188	-.007092	-.009238
0.3	.037449	.016789	.003746	-.004287	-.009230
0.4	.056716	.032174	.014592	.002460	-.005750
0.5	.076013	.048939	.027939	.012249	.000822
0.6	.095149	.066369	.042837	.024236	.009908
0.7	.114073	.084106	.058695	.037767	.020944
0.8	.132788	.101967	.075147	.052375	.033453
0.9	.151304	.119870	.091969	.067733	.047069
1.0	.169648	.137733	.109017	.083617	.061513

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032200	.023334	.018081	.014685	.012334
0.2	.077358	.064493	.054610	.047004	.041076
0.3	.122028	.108617	.096846	.086719	.078098
0.4	.165234	.152500	.140428	.129230	.119044
0.5	.207062	.195406	.183822	.172487	.161630
0.6	.247726	.237240	.226506	.215582	.204676
0.7	.287426	.278082	.268346	.258133	.247584
0.8	.326339	.318054	.309352	.300005	.290062
0.9	.364587	.357282	.349593	.341176	.331984
1.0	.402292	.395872	.389147	.381675	.373312

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.028891	.025861	.022669	.020166	.018265
0.2	.058504	.060234	.057798	.054096	.050314
0.3	.084579	.091828	.093100	.091006	.087328
0.4	.108518	.120326	.125836	.126770	.124794
0.5	.131049	.146467	.155883	.160238	.160808
0.6	.152577	.170871	.183669	.191346	.194768
0.7	.173353	.193976	.209651	.220366	.226640
0.8	.193551	.216087	.234205	.247630	.256609
0.9	.213283	.237422	.257624	.273443	.284915
1.0	.232644	.258139	.280130	.298058	.311799

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.014133	.007930	.005006	.003464	.002562
0.2	.041121	.030143	.022229	.016795	.013052
0.3	.070406	.058211	.047319	.038405	.031396
0.4	.100512	.088409	.076254	.065109	.055450
0.5	.131113	.119502	.107007	.094660	.083179
0.6	.162082	.151050	.138651	.125764	.113155
0.7	.193340	.182868	.170757	.157718	.144476
0.8	.224844	.214877	.203120	.190144	.176596
0.9	.256544	.247030	.235640	.222838	.209196
1.0	.288420	.279301	.268263	.255687	.242079

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.0$ $\gamma_2 = 1.4$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.053476	.068579	.076807	.081780	.085056
0.2	.081108	.104712	.122544	.135691	.145471
0.3	.107181	.132143	.154590	.173661	.189425
0.4	.134068	.157934	.181618	.203766	.223640
0.5	.161930	.184006	.207251	.230463	.252627
0.6	.190632	.210829	.232903	.255986	.279088
0.7	.220019	.238446	.259083	.281392	.304539
0.8	.249958	.266786	.285936	.307153	.329796
0.9	.280337	.295745	.313460	.333454	.355275
1.0	.311099	.325233	.341602	.360346	.381176

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.003080	-.002779	-.004810	-.005664	-.006080
0.2	.018281	.003480	-.004036	-.007909	-.009978
0.3	.036524	.015542	.002257	-.005871	-.010793
0.4	.055428	.030526	.012578	.000196	-.008122
0.5	.074360	.046928	.025496	.009434	-.002240
0.6	.093140	.064018	.040029	.020976	.006285
0.7	.111724	.081432	.055562	.034137	.016864
0.8	.130115	.098988	.071715	.048425	.028997
0.9	.148323	.116586	.088256	.063496	.042290
1.0	.166385	.134182	.105039	.079117	.056449

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032209	.023376	.018118	.014713	.012354
0.2	.077133	.064524	.054728	.047139	.041201
0.3	.121301	.108399	.096906	.086910	.078337
0.4	.163860	.151823	.140227	.129323	.119298
0.5	.204977	.194137	.183188	.172309	.161756
0.6	.244917	.235310	.225322	.214990	.204528
0.7	.283909	.275464	.266542	.257024	.247037
0.8	.322139	.314753	.306895	.298311	.289023
0.9	.359732	.353306	.346470	.338856	.330387
1.0	.396835	.391250	.385365	.378710	.371115

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.029129	.026155	.022928	.020377	.018434
0.2	.058852	.061044	.058764	.055048	.051179
0.3	.084777	.092857	.094649	.092781	.089130
0.4	.108432	.121297	.127649	.129127	.127420
0.5	.130617	.147209	.157692	.162875	.163996
0.6	.151777	.171292	.185293	.194014	.198243
0.7	.172185	.194032	.210980	.222887	.230173
0.8	.192024	.215765	.235180	.249886	.260026
0.9	.211409	.236720	.258214	.275360	.288097
1.0	.230450	.257068	.280326	.299593	.314666

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.014315	.008046	.005075	.003507	.002589
0.2	.041759	.030764	.022728	.017170	.013327
0.3	.071518	.059458	.048504	.039429	.032238
0.4	.102074	.090244	.078155	.066911	.057061
0.5	.133094	.121857	.109562	.097228	.085616
0.6	.164451	.153861	.141775	.129024	.116384
0.7	.196073	.186088	.174375	.161584	.148423
0.8	.227910	.218463	.207170	.194537	.181181
0.9	.259914	.250945	.240071	.227690	.214337
1.0	.292083	.283517	.273032	.260943	.247709

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.2$ $\gamma_2 = 0.6$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.054411	.069315	.077294	.082102	.085275
0.2	.083467	.107993	.125528	.138100	.147341
0.3	.110068	.137872	.161014	.179684	.194649
0.4	.136758	.165225	.191101	.213714	.233072
0.5	.163980	.192015	.218951	.243848	.266256
0.6	.191803	.218931	.245981	.272026	.296395
0.7	.220204	.246225	.272855	.299296	.324810
0.8	.249132	.273979	.299888	.326235	.352299
0.9	.278544	.302209	.327230	.353163	.379353
1.0	.308387	.330897	.354947	.380260	.406270

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.004102	-.001641	-.003810	-.004838	-.005408
0.2	.020809	.007047	-.000154	-.004190	-.006620
0.3	.040546	.021318	.009208	.001482	-.003593
0.4	.060945	.038171	.022132	.010919	.003016
0.5	.081338	.056203	.037177	.022982	.012409
0.6	.101503	.074746	.053472	.036827	.023886
0.7	.121369	.093466	.070494	.051871	.036896
0.8	.140916	.112191	.087928	.067719	.051025
0.9	.160160	.130829	.105578	.084099	.065969
1.0	.179111	.149332	.123323	.100828	.081502

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032079	.023153	.017937	.014580	.012257
0.2	.077628	.064050	.053991	.046407	.040561
0.3	.123422	.108446	.095947	.085565	.076925
0.4	.168206	.153173	.139721	.127801	.117313
0.5	.211819	.197324	.183768	.171189	.159635
0.6	.254308	.240626	.227454	.214801	.202768
0.7	.295772	.283023	.270517	.258174	.246091
0.8	.336304	.324539	.312860	.301081	.289255
0.9	.376014	.365228	.354464	.343415	.332065
1.0	.414976	.405150	.395347	.385133	.374416

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.027977	.024794	.021747	.019418	.017665
0.2	.056819	.057003	.054145	.050597	.047181
0.3	.082876	.087128	.086739	.084083	.080518
0.4	.107261	.115002	.117589	.116882	.114297
0.5	.130481	.141121	.146591	.148207	.147226
0.6	.152805	.165880	.173982	.177974	.178882
0.7	.174403	.189557	.200023	.206303	.209195
0.8	.195388	.212348	.224932	.233362	.238230
0.9	.215854	.234399	.248886	.259316	.266096
1.0	.235865	.255818	.272024	.284305	.292914

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.013510	.007532	.004769	.003318	.002468
0.2	.038906	.027957	.020481	.015493	.012099
0.3	.066509	.053682	.043039	.034752	.028426
0.4	.095036	.081602	.069178	.058485	.049615
0.5	.124200	.110661	.097281	.084963	.074110
0.6	.153887	.140442	.126564	.113173	.100837
0.7	.184025	.170751	.156628	.142530	.129099
0.8	.214558	.201481	.187252	.172684	.158446
0.9	.245449	.232564	.218306	.203422	.188582
1.0	.276655	.263953	.249706	.234607	.219313

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.2$ $\gamma_2 = 0.8$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.054254	.069185	.077207	.082044	.085235
0.2	.083135	.107429	.125000	.137670	.147006
0.3	.109824	.136936	.159889	.178611	.193713
0.4	.136841	.164147	.189476	.211948	.231380
0.5	.164567	.191035	.217033	.241499	.263812
0.6	.193020	.218250	.243992	.269278	.293313
0.7	.222133	.245997	.270994	.296350	.321252
0.8	.251831	.274324	.298324	.323281	.348448
0.9	.282041	.303207	.326098	.350370	.375383
1.0	.312701	.332610	.354350	.377768	.402345

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.003884	-.001864	-.004001	-.004994	-.005534
0.2	.020141	.006259	-.000952	-.004926	-.007272
0.3	.039289	.019857	.007634	-.000081	-.005064
0.4	.058986	.035975	.019735	.008449	.000590
0.5	.078596	.053220	.033937	.019588	.008991
0.6	.097926	.070938	.049376	.032514	.019479
0.7	.116927	.088804	.065532	.046649	.031517
0.8	.135597	.106661	.082093	.061594	.044694
0.9	.153956	.124424	.098868	.077079	.058703
1.0	.172032	.142055	.115741	.092921	.073318

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032059	.023178	.017963	.014601	.012273
0.2	.077225	.063976	.054037	.046490	.040646
0.3	.122195	.107921	.095799	.085602	.077046
0.4	.165816	.151836	.139070	.127568	.117318
0.5	.208032	.194880	.182314	.170418	.159312
0.6	.248971	.236858	.224942	.213237	.201884
0.7	.288786	.277773	.266746	.255595	.244426
0.8	.327619	.317706	.307680	.297304	.286613
0.9	.365597	.356742	.347766	.338296	.328280
1.0	.402829	.394979	.387058	.378563	.369351

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.028175	.025042	.021964	.019595	.017807
0.2	.057084	.057717	.054989	.051416	.047918
0.3	.082906	.088064	.088165	.085683	.082110
0.4	.106830	.115861	.119335	.119119	.116728
0.5	.129436	.141660	.148377	.150830	.150321
0.6	.151045	.165920	.175566	.180723	.182405
0.7	.171859	.188969	.201214	.208946	.212909
0.8	.192022	.211045	.225587	.235710	.241919
0.9	.211641	.232318	.248898	.261217	.269577
1.0	.230797	.252924	.271317	.285642	.296033

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.013687	.007637	.004830	.003355	.002492
0.2	.039640	.028595	.020963	.015841	.012348
0.3	.067981	.055143	.044313	.035787	.029241
0.4	.097343	.084017	.071454	.060484	.051302
0.5	.127400	.114085	.100653	.088083	.076876
0.6	.158010	.144893	.131067	.117486	.104803
0.7	.189081	.176227	.162260	.148055	.134321
0.8	.220548	.207972	.193996	.179415	.164939
0.9	.252358	.240049	.226137	.211335	.196337
1.0	.284467	.272408	.258593	.243669	.228304

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.2$ $\gamma_2 = 1.0$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.054100	.069056	.077120	.081986	.085196
0.2	.082819	.106882	.124482	.137245	.146673
0.3	.109604	.136053	.158809	.177569	.192797
0.4	.136929	.163161	.187954	.210265	.229749
0.5	.165107	.190168	.215280	.239307	.261498
0.6	.194100	.217674	.242219	.266768	.290446
0.7	.223808	.245836	.269379	.293717	.318006
0.8	.254127	.274661	.297007	.320697	.344997
0.9	.284971	.304100	.325181	.347978	.371891
1.0	.316269	.334089	.353910	.375683	.398953

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.003668	-.002085	-.004191	-.005150	-.005660
0.2	.019504	.005494	-.001734	-.005653	-.007917
0.3	.038122	.018475	.006124	-.001598	-.006505
0.4	.057211	.033949	.017485	.006095	-.001747
0.5	.076167	.050532	.030962	.016418	.005753
0.6	.094821	.067574	.045690	.028564	.015376
0.7	.113139	.084763	.061150	.041950	.026594
0.8	.131133	.101947	.077028	.056176	.038993
0.9	.148833	.119049	.093134	.070967	.052261
1.0	.166271	.136035	.109354	.086136	.066166

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032039	.023203	.017989	.014622	.012289
0.2	.076840	.063904	.054082	.046571	.040731
0.3	.121050	.107423	.095656	.085639	.077164
0.4	.163642	.150595	.138456	.127345	.117324
0.5	.204664	.192664	.180970	.169695	.159005
0.6	.244318	.233507	.222665	.211796	.201058
0.7	.282807	.273192	.263391	.253258	.242894
0.8	.320306	.311843	.303148	.293938	.284218
0.9	.356968	.349580	.341998	.333803	.324898
1.0	.392918	.386520	.380022	.372878	.364888

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.028371	.025288	.022180	.019772	.017949
0.2	.057336	.058410	.055816	.052224	.048648
0.3	.082928	.088948	.089532	.087237	.083669
0.4	.106431	.116646	.120971	.121250	.119071
0.5	.128497	.142132	.150008	.153277	.153252
0.6	.149497	.165933	.176975	.183232	.185682
0.7	.169668	.188429	.202241	.211308	.216300
0.8	.189173	.209896	.226120	.237762	.245225
0.9	.208135	.230531	.248864	.262836	.272637
1.0	.226647	.250485	.270668	.286742	.298722

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.013862	.007742	.004891	.003392	.002515
0.2	.040341	.029214	.021436	.016184	.012595
0.3	.069346	.056525	.045535	.036792	.030039
0.4	.099430	.086243	.073589	.062389	.052927
0.5	.130229	.117168	.103750	.090997	.079497
0.6	.161582	.148819	.135116	.121436	.108496
0.7	.193385	.180969	.167230	.153025	.139100
0.8	.225563	.213496	.199845	.185366	.170785
0.9	.258061	.246322	.232820	.218220	.203210
1.0	.290836	.279395	.266068	.251440	.236160

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.2$ $\gamma_2 = 1.2$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.053948	.068928	.077033	.081928	.085156
0.2	.082518	.106351	.123974	.136826	.146344
0.3	.109404	.135218	.157771	.176556	.191900
0.4	.137019	.162255	.186525	.208661	.228175
0.5	.165602	.189395	.213672	.237259	.259304
0.6	.195065	.217182	.240629	.264469	.287774
0.7	.225274	.245723	.267965	.291350	.315031
0.8	.256105	.274985	.295882	.318417	.341888
0.9	.287455	.304898	.324428	.345908	.368796
1.0	.319247	.335372	.353579	.373914	.395994

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.003456	-.002304	-.004380	-.005304	-.005785
0.2	.018894	.004752	-.002501	-.006372	-.008557
0.3	.037036	.017167	.004673	-.003073	-.007916
0.4	.055597	.032075	.015368	.003850	-.004002
0.5	.074002	.048095	.028220	.013451	.002682
0.6	.092100	.064581	.042356	.024931	.011548
0.7	.109871	.081227	.057252	.037701	.022073
0.8	.127337	.097880	.072589	.051350	.033834
0.9	.144526	.114473	.088178	.065597	.046510
1.0	.161477	.130968	.103900	.080250	.059861

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032018	.023227	.018015	.014643	.012305
0.2	.076470	.063834	.054127	.046651	.040815
0.3	.119980	.106949	.095519	.085675	.077280
0.4	.161655	.149442	.137876	.127132	.117330
0.5	.201649	.190643	.179725	.169015	.158713
0.6	.240226	.230508	.220593	.210463	.200284
0.7	.277632	.269162	.260386	.251131	.241479
0.8	.314070	.306758	.299149	.290918	.282037
0.9	.349696	.343452	.336979	.329826	.321858
1.0	.384650	.379365	.373977	.367910	.360924

Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.028562	.025531	.022395	.019947	.018090
0.2	.057576	.059082	.056628	.053023	.049372
0.3	.082944	.089782	.090846	.088748	.085196
0.4	.106058	.117367	.122508	.123282	.121332
0.5	.127647	.142548	.151505	.155564	.156031
0.6	.148126	.165927	.178237	.185532	.188736
0.7	.167761	.187935	.203134	.213430	.219406
0.8	.186733	.208878	.226560	.239568	.248203
0.9	.205170	.228979	.248801	.264229	.275348
1.0	.223173	.248397	.270077	.287660	.301063

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.014033	.007845	.004951	.003429	.002539
0.2	.041012	.029815	.021899	.016523	.012841
0.3	.070616	.057833	.046710	.037769	.030821
0.4	.101326	.088303	.075598	.064207	.054495
0.5	.132749	.119961	.106603	.093726	.081983
0.6	.164709	.152309	.138778	.125069	.111941
0.7	.197093	.185115	.171648	.157519	.143491
0.8	.229825	.218255	.204966	.190665	.176076
0.9	.262845	.251656	.238593	.224266	.209347
1.0	.296111	.285263	.272443	.258177	.243083

TABLE 2-1 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.2$ $\gamma_2 = 1.4$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.053799	.068800	.076947	.081871	.085117
0.2	.082232	.105835	.123475	.136412	.146017
0.3	.109222	.134428	.156773	.175571	.191021
0.4	.137109	.161420	.185180	.207129	.226657
0.5	.166059	.188703	.212191	.235340	.257219
0.6	.195933	.216759	.239196	.262353	.285278
0.7	.226568	.245645	.266717	.289210	.312295
0.8	.257827	.275293	.294914	.316392	.339072
0.9	.289592	.305608	.323799	.344099	.366033
1.0	.321784	.336496	.353326	.372395	.393390

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.003248	-.002522	-.004568	-.005459	-.005911
0.2	.018311	.004030	-.003254	-.007081	-.009192
0.3	.036021	.015926	.003276	-.004506	-.009299
0.4	.054122	.030337	.013374	.001706	-.006178
0.5	.072058	.045878	.025685	.010668	-.000236
0.6	.089696	.061903	.039326	.021580	.007968
0.7	.107024	.078105	.053762	.033840	.017905
0.8	.124067	.094337	.068668	.047024	.029142
0.9	.140858	.110528	.083850	.060841	.041342
1.0	.157433	.126646	.099189	.075094	.054260

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.031999	.023252	.018041	.014663	.012321
0.2	.076115	.063766	.054171	.046730	.040899
0.3	.118977	.106498	.095386	.085710	.077393
0.4	.159833	.148367	.137328	.126929	.117335
0.5	.198933	.188795	.178568	.168375	.158435
0.6	.236600	.227810	.218699	.209227	.199558
0.7	.273112	.265586	.257680	.249187	.240168
0.8	.308686	.302308	.295597	.288193	.280042
0.9	.343490	.338145	.332573	.326283	.319109
1.0	.377664	.373240	.368728	.363532	.357380

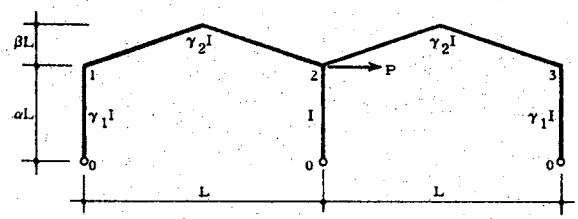
Q_{23}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.028751	.025774	.022609	.020122	.018232
0.2	.057804	.059736	.057425	.053811	.050091
0.3	.082956	.090572	.092110	.090216	.086692
0.4	.105711	.118030	.123954	.125223	.123513
0.5	.126875	.142917	.152883	.157707	.158671
0.6	.146904	.165907	.179373	.187647	.191590
0.7	.166088	.187481	.203918	.215347	.222263
0.8	.184619	.207971	.226929	.241169	.250900
0.9	.202632	.227616	.248723	.265442	.277767
1.0	.220231	.246594	.269539	.288438	.303120

Q_{32}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.014202	.007948	.005012	.003466	.002562
0.2	.041653	.030399	.022354	.016858	.013084
0.3	.071801	.059074	.047841	.038719	.031586
0.4	.103057	.090213	.077491	.065942	.056008
0.5	.135009	.122502	.109241	.096285	.084345
0.6	.167468	.155432	.142105	.128420	.115165
0.7	.200322	.188771	.175603	.161603	.147537
0.8	.233493	.222397	.209488	.195415	.180887
0.9	.266919	.256243	.243629	.229619	.214857
1.0	.300564	.290263	.277946	.264074	.249230

TABLE 2-2 MOMENT COEFFICIENTS TWO SPAN FRAME



$M_{12} = +Q_{12}PL$
$M_{21} = +Q_{21}PL$
$M_{20} = -Q_{20}PL$
$M_{23} = +Q_{21}PL$
$M_{32} = +Q_{12}PL$

$\gamma_1 = 0.8$ $\gamma_2 = 0.6$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.016462	.011803	.009101	.007373	.006183
0.2	.041118	.033589	.028071	.023957	.020820
0.3	.067336	.058477	.051163	.045174	.040270
0.4	.094298	.084785	.076345	.068992	.062656
0.5	.121753	.111917	.102755	.094412	.086946
0.6	.149583	.139598	.129964	.120897	.112541
0.7	.177712	.167681	.157735	.148128	.139068
0.8	.206094	.196075	.185922	.175909	.166286
0.9	.234686	.224719	.214430	.204108	.194031
1.0	.263467	.253570	.243195	.232635	.222189

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.033538	.038200	.040899	.042627	.043817
0.2	.058882	.066411	.071929	.076043	.079180
0.3	.082664	.091523	.098837	.104826	.109730
0.4	.105702	.115214	.123655	.131008	.137344
0.5	.128247	.138083	.147245	.155588	.163054
0.6	.150419	.160402	.170036	.179103	.187459
0.7	.172288	.182319	.192265	.201872	.210932
0.8	.193908	.203925	.214078	.224091	.233714
0.9	.215313	.225281	.235570	.245892	.255969
1.0	.236537	.246432	.256806	.267365	.277811

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.067076	.076400	.081798	.085254	.087634
0.2	.117764	.132822	.143858	.152086	.158360
0.3	.165328	.183046	.197674	.209652	.219460
0.4	.211404	.230428	.247310	.262016	.274688
0.5	.256494	.276166	.294490	.311176	.326108
0.6	.300838	.320804	.340072	.358206	.374918
0.7	.344576	.364638	.384530	.403744	.421864
0.8	.387816	.407850	.428156	.448182	.467428
0.9	.430626	.450562	.471140	.491784	.511938
1.0	.473074	.492864	.513612	.534730	.555622

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 0.8$ $\gamma_2 = 0.8$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.016588	.011889	.009158	.007411	.006210
0.2	.041613	.034040	.028437	.024242	.021038
0.3	.068315	.059470	.052060	.045939	.040904
0.4	.095816	.086403	.077899	.070397	.063883
0.5	.123834	.114190	.105024	.096550	.088888
0.6	.152232	.142530	.132966	.123809	.115265
0.7	.180923	.171261	.161465	.151826	.142606
0.8	.209854	.200285	.190361	.180384	.170646
0.9	.238979	.229534	.219555	.209340	.199203
1.0	.268276	.258965	.248975	.238596	.228154

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.033412	.038111	.040842	.042589	.043790
0.2	.058387	.065960	.071563	.075758	.078962
0.3	.081685	.090530	.097940	.104061	.109096
0.4	.104183	.113597	.122101	.129603	.136117
0.5	.126165	.135811	.144976	.153450	.161113
0.6	.147769	.157470	.167034	.176191	.184735
0.7	.169076	.178738	.188535	.198174	.207394
0.8	.190146	.199716	.209638	.219616	.229354
0.9	.211015	.220466	.230446	.240660	.250797
1.0	.231724	.241036	.251025	.261403	.271847

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.066824	.076222	.081684	.085178	.087580
0.2	.116774	.131920	.143126	.151516	.157924
0.3	.163370	.181060	.195880	.208122	.218192
0.4	.208366	.227194	.244202	.259206	.272234
0.5	.252330	.271622	.289952	.306900	.322226
0.6	.295538	.314940	.334068	.352382	.369470
0.7	.338152	.357476	.377070	.396348	.414788
0.8	.380292	.399432	.419276	.439232	.458708
0.9	.422030	.440932	.460892	.481320	.501594
1.0	.463448	.482072	.502050	.522806	.543694

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 0.8$ $\gamma_2 = 1.0$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.016711	.011975	.009215	.007449	.006236
0.2	.042084	.034476	.028795	.024522	.021255
0.3	.069204	.060406	.052919	.046679	.041522
0.4	.097183	.087889	.079353	.071732	.065062
0.5	.125662	.116229	.107100	.098540	.090719
0.6	.154508	.145104	.135656	.126467	.117790
0.7	.183630	.174342	.164742	.155139	.145831
0.8	.212972	.203841	.194192	.184323	.174554
0.9	.242484	.233537	.223902	.213870	.203767
1.0	.272140	.263382	.253804	.243681	.233340

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.033289	.038025	.040785	.042551	.043764
0.2	.057916	.065524	.071205	.075478	.078745
0.3	.080780	.089594	.097081	.103321	.108478
0.4	.102817	.112111	.120647	.128268	.134938
0.5	.124338	.133772	.142900	.151460	.159281
0.6	.145493	.154896	.164344	.173533	.182210
0.7	.166369	.175658	.185258	.194861	.204169
0.8	.187031	.196159	.205808	.215677	.225446
0.9	.207515	.216465	.226098	.236130	.246232
1.0	.227855	.236619	.246196	.256319	.266660

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.066578	.076050	.081570	.085102	.087528
0.2	.115832	.131048	.142410	.150956	.157490
0.3	.161560	.179188	.194162	.206642	.216956
0.4	.205634	.224222	.241294	.256536	.269876
0.5	.248676	.267544	.285800	.302920	.318562
0.6	.290986	.309792	.328688	.347066	.364420
0.7	.332738	.351316	.370516	.389722	.408338
0.8	.374062	.392318	.411616	.431354	.450892
0.9	.415030	.432930	.452196	.472260	.492464
1.0	.455710	.473238	.492392	.512638	.533320

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 0.8$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.016833	.012060	.009271	.007487	.006262
0.2	.042534	.034899	.029145	.024798	.021469
0.3	.070060	.061291	.053742	.047396	.042125
0.4	.098418	.089259	.080717	.073000	.066195
0.5	.127280	.118068	.109007	.100395	.092451
0.6	.156485	.147381	.138079	.128902	.120138
0.7	.185943	.177020	.167643	.158123	.148781
0.8	.215593	.206885	.197529	.187817	.178077
0.9	.245396	.236914	.227637	.217831	.207826
1.0	.275320	.267063	.257900	.248069	.237892

$\gamma_2 = 1.2$

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.033167	.037940	.040729	.042513	.043738
0.2	.057466	.065101	.070855	.075202	.078531
0.3	.079940	.088709	.096258	.102604	.107875
0.4	.101582	.110741	.119283	.127000	.133805
0.5	.122720	.131932	.140993	.149604	.157549
0.6	.143514	.152620	.161921	.171098	.179862
0.7	.164056	.172979	.182357	.191877	.201219
0.8	.184406	.193113	.202470	.212184	.221923
0.9	.204605	.213085	.222363	.232169	.242174
1.0	.224682	.232935	.242101	.251932	.262107

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.066334	.075880	.081458	.085026	.087476
0.2	.114932	.130202	.141710	.150404	.157062
0.3	.159880	.177418	.192516	.205208	.215750
0.4	.203164	.221482	.238566	.254000	.267610
0.5	.245440	.263864	.281986	.299208	.315098
0.6	.287028	.305240	.323842	.342196	.359724
0.7	.328112	.345958	.364714	.383754	.402438
0.8	.368812	.386226	.404940	.424368	.443846
0.9	.409210	.426170	.444726	.464338	.484348
1.0	.449364	.465870	.484202	.503864	.524214

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 0.8$ $\gamma_2 = 1.4$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.016952	.012144	.009327	.007524	.006288
0.2	.042963	.035309	.029488	.025070	.021680
0.3	.070841	.062127	.054531	.048091	.042715
0.4	.099542	.090527	.081997	.074207	.067284
0.5	.128722	.119737	.110764	.102131	.094090
0.6	.158219	.149409	.140274	.131142	.122326
0.7	.187940	.179371	.170230	.160826	.151492
0.8	.217835	.209522	.200465	.190936	.181270
0.9	.247856	.239804	.230881	.221324	.211457
1.0	.277973	.270178	.261416	.251893	.241919

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.033048	.037856	.040673	.042476	.043712
0.2	.057037	.064691	.070512	.074930	.078320
0.3	.079159	.087873	.095469	.101909	.107286
0.4	.100458	.109473	.118003	.125793	.132716
0.5	.121278	.130264	.139236	.147869	.155910
0.6	.141780	.150591	.159726	.168858	.177674
0.7	.162056	.170630	.179771	.189175	.198508
0.8	.182170	.190478	.199535	.209046	.218730
0.9	.202151	.210194	.219120	.228676	.238543
1.0	.220026	.229815	.238584	.248107	.258081

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.066096	.075712	.081346	.084952	.087424
0.2	.114074	.129382	.141024	.149860	.156640
0.3	.158318	.175746	.190938	.203818	.214572
0.4	.200916	.218946	.236006	.251586	.265432
0.5	.242556	.260528	.278472	.295738	.311820
0.6	.283560	.301182	.319452	.337716	.355348
0.7	.324112	.341260	.359542	.378350	.397016
0.8	.364340	.380956	.390070	.418128	.437460
0.9	.404302	.420388	.438240	.457352	.477086
1.0	.444052	.459630	.477168	.496214	.516162

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.0$ $\gamma_2 = 0.6$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.016496	.011815	.009107	.007376	.006185
0.2	.041355	.033716	.028143	.024000	.020846
0.3	.067976	.058888	.051427	.045347	.040385
0.4	.095526	.085657	.076956	.069419	.062957
0.5	.123734	.113417	.103869	.095232	.087550
0.6	.152461	.141879	.131731	.122248	.113570
0.7	.181618	.170881	.160294	.150144	.140646
0.8	.211142	.200318	.189400	.178715	.168532
0.9	.240980	.230115	.218943	.207821	.197058
1.0	.271100	.260220	.248848	.237362	.226102

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.033504	.038185	.040893	.042624	.043815
0.2	.058645	.066284	.071857	.076000	.079154
0.3	.082024	.091112	.098573	.104653	.109615
0.4	.104474	.114343	.123044	.130581	.137043
0.5	.126267	.136583	.146131	.154768	.162450
0.6	.147540	.158121	.168269	.177752	.186430
0.7	.168382	.179119	.189706	.199856	.209354
0.8	.188858	.199683	.210600	.221285	.231468
0.9	.209015	.219885	.231057	.242179	.252943
1.0	.228899	.239783	.251152	.262639	.273898

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.067008	.076370	.081786	.085248	.087630
0.2	.117290	.132568	.143714	.152000	.158308
0.3	.164048	.182224	.197146	.209306	.219230
0.4	.208948	.228686	.246088	.261162	.274086
0.5	.252534	.273166	.292262	.309536	.324900
0.6	.295080	.316242	.336538	.355504	.372860
0.7	.336764	.358238	.379412	.399712	.418708
0.8	.377716	.399366	.421200	.442570	.462936
0.9	.418030	.439770	.462114	.484358	.505886
1.0	.457798	.479566	.502304	.525278	.547796

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.0$ $\gamma_2 = 0.8$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.016633	.011906	.009165	.007415	.006212
0.2	.041425	.034209	.028533	.024298	.021073
0.3	.069149	.060012	.052412	.046169	.041058
0.4	.097400	.087540	.078705	.070965	.064285
0.5	.126356	.116126	.106479	.097631	.089688
0.6	.155858	.145445	.135253	.125575	.116621
0.7	.185797	.175310	.164745	.154439	.144670
0.8	.216099	.205602	.194779	.183990	.173561
0.9	.246699	.236239	.225237	.214072	.203103
1.0	.277567	.267160	.256035	.244574	.233159

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.033367	.038094	.040835	.042585	.043788
0.2	.058075	.065791	.071467	.075702	.078927
0.3	.080851	.089988	.097588	.103831	.108943
0.4	.102602	.112460	.121295	.129035	.135715
0.5	.123644	.133874	.143521	.152369	.160312
0.6	.144143	.154555	.164747	.174425	.183379
0.7	.164203	.174690	.185255	.195561	.205330
0.8	.183903	.194398	.205221	.216010	.226439
0.9	.203295	.213762	.224763	.235928	.246898
1.0	.222435	.232842	.243965	.255426	.266842

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.066734	.076188	.081670	.085170	.087576
0.2	.116150	.131582	.142934	.151404	.157854
0.3	.161702	.179976	.195176	.207662	.217886
0.4	.205204	.224920	.242590	.258070	.271430
0.5	.247290	.267747	.287042	.304738	.320624
0.6	.288286	.309110	.329494	.348850	.366758
0.7	.328406	.349380	.370510	.391122	.410660
0.8	.367806	.388796	.410442	.432020	.452878
0.9	.406590	.427524	.449526	.471856	.493796
1.0	.444870	.465684	.487930	.510852	.533684

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.0$ $\gamma_2 = 1.0$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.016768	.011996	.009224	.007454	.006238
0.2	.042471	.034688	.028915	.024593	.021298
0.3	.070240	.061076	.053357	.046967	.041715
0.4	.099093	.089280	.080348	.072437	.065564
0.5	.128676	.118573	.108881	.099873	.091714
0.6	.158802	.148599	.138428	.128629	.119462
0.7	.189350	.179152	.168684	.158312	.148359
0.8	.220242	.210106	.199458	.188669	.178099
0.9	.251412	.241376	.230624	.219530	.208477
1.0	.282815	.272896	.262095	.250779	.239344

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.033232	.038004	.040776	.042546	.043762
0.2	.057529	.065312	.071085	.075407	.078702
0.3	.079760	.088924	.096643	.103032	.108285
0.4	.100907	.110720	.119652	.127563	.134436
0.5	.121325	.131427	.141119	.150127	.158286
0.6	.141198	.151402	.161572	.171370	.180537
0.7	.160648	.170847	.181316	.191688	.201641
0.8	.179759	.189892	.200542	.211332	.221901
0.9	.198589	.208624	.219376	.230470	.241523
1.0	.217186	.227104	.237905	.249222	.260656

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.066464	.076008	.081552	.085092	.087524
0.2	.115058	.130624	.142170	.150814	.157404
0.3	.159520	.177848	.193286	.206064	.216570
0.4	.201814	.221440	.239304	.255126	.268872
0.5	.242650	.262854	.282238	.300254	.316572
0.6	.282396	.302804	.323144	.342740	.361074
0.7	.321296	.341694	.362632	.383376	.403282
0.8	.359518	.379784	.401084	.422664	.443802
0.9	.397178	.417248	.438752	.460940	.483046
1.0	.434372	.454208	.475810	.498444	.521312

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.0$ $\gamma_2 = 1.2$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.016900	.012085	.009282	.007492	.006265
0.2	.042992	.035152	.029290	.024884	.021521
0.3	.071256	.062085	.054265	.047742	.042358
0.4	.100635	.090893	.081895	.073842	.066797
0.5	.130744	.120795	.111099	.101975	.093636
0.6	.161379	.151408	.141307	.131443	.122118
0.7	.192410	.182518	.172196	.161823	.151753
0.8	.223759	.213992	.203565	.192846	.182216
0.9	.255355	.245747	.235287	.224335	.213286
1.0	.287161	.277719	.267274	.256172	.244810

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.003100	.037915	.040718	.042508	.043735
0.2	.057007	.064848	.070710	.075116	.078479
0.3	.078744	.087915	.095735	.102258	.107642
0.4	.099365	.109107	.118105	.126158	.133203
0.5	.119257	.129205	.138901	.148025	.156364
0.6	.138623	.148593	.158693	.168557	.177882
0.7	.157589	.167482	.177804	.188177	.198247
0.8	.176243	.186006	.196434	.207154	.217784
0.9	.194643	.204253	.214713	.225665	.236714
1.0	.212843	.222283	.232725	.243828	.255190

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.066200	.075830	.081436	.085016	.087470
0.2	.114014	.129696	.141420	.150232	.156958
0.3	.157488	.175830	.191470	.204516	.215284
0.4	.198730	.218214	.236210	.252316	.266406
0.5	.238514	.258410	.277802	.296050	.312728
0.6	.277246	.297186	.317386	.337114	.355764
0.7	.315178	.334964	.355608	.376354	.396494
0.8	.352486	.372012	.392868	.414308	.435568
0.9	.389286	.408506	.429426	.451330	.473428
1.0	.425686	.444566	.465450	.487656	.510380

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.0$ $\gamma_2 = 1.4$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.017031	.012173	.009340	.007531	.006291
0.2	.043492	.035604	.029657	.025171	.021742
0.3	.072205	.063043	.055139	.048495	.042986
0.4	.102045	.092392	.083355	.075183	.067985
0.5	.132598	.122820	.113152	.103948	.095462
0.6	.163650	.153925	.143929	.134043	.124604
0.7	.195073	.185489	.175346	.165019	.154886
0.8	.226780	.217380	.207200	.196598	.185967
0.9	.258703	.249511	.239363	.228599	.217616
1.0	.290822	.281828	.271751	.260904	.249674

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032969	.037827	.040660	.042469	.043709
0.2	.056508	.064396	.070343	.074829	.078258
0.3	.077795	.086957	.094861	.101505	.107014
0.4	.097956	.107608	.116645	.124817	.132014
0.5	.117403	.127180	.136848	.146052	.154538
0.6	.136350	.146075	.156071	.165957	.175396
0.7	.154927	.164510	.174654	.184981	.195113
0.8	.173223	.182621	.192801	.203402	.214033
0.9	.191289	.200488	.210638	.221401	.232385
1.0	.209186	.218172	.228249	.239096	.250325

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.065938	.075654	.081320	.084938	.087418
0.2	.113016	.128792	.140686	.149658	.156516
0.3	.155590	.173914	.189722	.203010	.214028
0.4	.195912	.215216	.233290	.249634	.264028
0.5	.234806	.254360	.273696	.292104	.309076
0.6	.272700	.292150	.312142	.331914	.350792
0.7	.309854	.329020	.349308	.369962	.390226
0.8	.346446	.365242	.385602	.406804	.428066
0.9	.382578	.400976	.421276	.442802	.464770
1.0	.418372	.436344	.456498	.478192	.500650

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.2$ $\gamma_2 = 0.6$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.016519	.011823	.009110	.007378	.006186
0.2	.041514	.033802	.028191	.024028	.020863
0.3	.068410	.059165	.051605	.045463	.040462
0.4	.096362	.086248	.077369	.069707	.063159
0.5	.125089	.114439	.104625	.095787	.087957
0.6	.154441	.143442	.132936	.123166	.114267
0.7	.184319	.173083	.162047	.151519	.141718
0.8	.214646	.203248	.191792	.180636	.170063
0.9	.245374	.233858	.222059	.210372	.199128
1.0	.276447	.264848	.252765	.240620	.228788

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.033481	.038177	.040890	.042622	.043814
0.2	.058486	.066198	.071809	.075972	.079137
0.3	.081590	.090835	.098395	.104537	.109538
0.4	.103637	.113752	.122631	.130293	.136840
0.5	.124910	.135560	.145375	.154213	.162043
0.6	.145558	.156558	.167064	.176834	.185733
0.7	.165682	.176917	.187954	.198481	.208282
0.8	.185351	.196751	.208208	.219364	.229937
0.9	.204630	.216142	.227941	.239628	.250872
1.0	.223562	.235152	.247236	.259380	.271212

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.066962	.076353	.081780	.085244	.087628
0.2	.116972	.132396	.143618	.151944	.158274
0.3	.163180	.181670	.196790	.209074	.219076
0.4	.207274	.227504	.245262	.260586	.273680
0.5	.249820	.271120	.290750	.308426	.324086
0.6	.291116	.313116	.334128	.353668	.371466
0.7	.331364	.353834	.375908	.396962	.416564
0.8	.370702	.393502	.416416	.438728	.459874
0.9	.409260	.432284	.455882	.479256	.501744
1.0	.447124	.470304	.494472	.518760	.542424

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.2$ $\gamma_2 = 0.8$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.016663	.011917	.009170	.007417	.006213
0.2	.042136	.034323	.028597	.024336	.21096
0.3	.069717	.060379	.052649	.046324	.041161
0.4	.098481	.088316	.079251	.071348	.064556
0.5	.128094	.117455	.107472	.098365	.090230
0.6	.158373	.147456	.136821	.126781	.117543
0.7	.189195	.178116	.167006	.156231	.146079
0.8	.220471	.209308	.197840	.186476	.175560
0.9	.252131	.240929	.229192	.217348	.205787
1.0	.284124	.272916	.260968	.248728	.236619

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.033337	.038083	.040830	.042583	.043787
0.2	.057864	.065677	.071403	.075664	.078904
0.3	.080283	.089621	.097351	.103676	.108839
0.4	.101519	.111684	.120749	.128652	.135444
0.5	.121906	.132546	.142528	.151635	.159770
0.6	.141628	.152545	.163179	.173219	.182458
0.7	.160805	.171882	.182994	.193769	.203921
0.8	.179529	.190694	.202160	.213524	.224440
0.9	.197866	.209069	.220808	.232652	.244212
1.0	.215874	.227083	.239032	.251272	.263381

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.066674	.076166	.081660	.085166	.087574
0.2	.115728	.131354	.142806	.151328	.157808
0.3	.160566	.179242	.194702	.207352	.217678
0.4	.203038	.223368	.241498	.257304	.270888
0.5	.243812	.265092	.285056	.303270	.319540
0.6	.283256	.305090	.326358	.346438	.364916
0.7	.321610	.343764	.365988	.387538	.407842
0.8	.359058	.381388	.404320	.427048	.448880
0.9	.395732	.418138	.441616	.465304	.488424
1.0	.431748	.454166	.478064	.502544	.526762

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.2$ $\gamma_2 = 1.0$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.016805	.012010	.009230	.007457	.006240
0.2	.042732	.034830	.028996	.024641	.021328
0.3	.070936	.061531	.053653	.047162	.041844
0.4	.100408	.090233	.081025	.072916	.065903
0.5	.130767	.120190	.110101	.100782	.092390
0.6	.161799	.151023	.140340	.130113	.120605
0.7	.193367	.182509	.171419	.160501	.150093
0.8	.225370	.274661	.203131	.191681	.180544
0.9	.257737	.246902	.235334	.223473	.211739
1.0	.290413	.279632	.267930	.255744	.243520

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.033195	.037990	.040770	.042543	.043760
0.2	.057268	.065169	.071004	.075359	.078672
0.3	.079064	.088469	.096347	.102838	.108156
0.4	.099592	.109767	.118975	.127084	.134096
0.5	.119234	.129810	.139898	.149217	.157610
0.6	.138201	.148976	.159659	.169887	.179395
0.7	.156633	.167489	.178581	.189499	.199907
0.8	.174628	.101947	.196869	.208319	.219456
0.9	.192263	.203099	.214666	.226528	.238261
1.0	.209599	.220370	.232070	.244256	.256480

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.066390	.075980	.081540	.085086	.087520
0.2	.114536	.130338	.142008	.150718	.157344
0.3	.158128	.176938	.192694	.205676	.216312
0.4	.199184	.219534	.237950	.254168	.268192
0.5	.238468	.259620	.279796	.298434	.315220
0.6	.276402	.297952	.319318	.339774	.358790
0.7	.313266	.334978	.357162	.378998	.399814
0.8	.349256	.311844	.393738	.416638	.438912
0.9	.384526	.406198	.429332	.453056	.476522
1.0	.419198	.440740	.464140	.488512	.512960

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.2$ $\gamma_2 = 1.2$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.016945	.012102	.009290	.007496	.006267
0.2	.043304	.035324	.029387	.024941	.021557
0.3	.072076	.062626	.054620	.047976	.042514
0.4	.102169	.092016	.082700	.074414	.067204
0.5	.133159	.122683	.112538	.103056	.094443
0.6	.164813	.154216	.143545	.133193	.123475
0.7	.196979	.186376	.175371	.164387	.153801
0.8	.229553	.219008	.207798	.196351	.185084
0.9	.262457	.252013	.240679	.228892	.217089
1.0	.295639	.285305	.273911	.261876	.249649

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.033055	.037898	.040710	.042504	.043733
0.2	.056696	.064676	.070613	.075059	.078443
0.3	.077924	.087374	.095380	.102024	.107486
0.4	.097831	.107984	.117300	.125586	.132796
0.5	.116841	.127317	.137462	.146944	.155557
0.6	.135188	.145783	.156455	.166807	.176525
0.7	.153021	.163624	.174629	.185613	.196199
0.8	.170448	.180991	.192201	.203649	.214917
0.9	.187541	.197991	.209321	.221108	.232911
1.0	.204366	.214694	.226088	.238125	.250351

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.066109	.075796	.081420	.085008	.087466
0.2	.113392	.129352	.141226	.150118	.156886
0.3	.155848	.174748	.190760	.204048	.214972
0.4	.195662	.215968	.234600	.251172	.265592
0.5	.233682	.254634	.274924	.293888	.311114
0.6	.270376	.291566	.312910	.333614	.353050
0.7	.306042	.327248	.349258	.371226	.392398
0.8	.340896	.361982	.384402	.407298	.429834
0.9	.375082	.395982	.418642	.442216	.465822
1.0	.408732	.429388	.452176	.476250	.500702

TABLE 2-2 (cont.) MOMENT COEFFICIENTS TWO SPAN FRAME

$\gamma_1 = 1.2$ $\gamma_2 = 1.4$

Q_{12}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.017083	.012193	.009349	.007535	.006294
0.2	.043852	.035803	.029771	.025238	.021784
0.3	.073144	.063669	.055551	.048768	.043169
0.4	.103784	.093678	.084284	.075849	.068461
0.5	.135314	.124965	.114802	.105196	.096399
0.6	.167483	.157091	.146473	.136049	.126169
0.7	.200136	.189806	.178931	.167939	.157235
0.8	.233164	.222953	.211946	.200563	.189236
0.9	.266489	.256430	.245372	.233722	.221924
1.0	.300062	.290165	.279107	.267279	.255127

Q_{21}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.032917	.037807	.040651	.042465	.043706
0.2	.056148	.064197	.070229	.074762	.078216
0.3	.076856	.086331	.094449	.101232	.106831
0.4	.096216	.106321	.115715	.124151	.131539
0.5	.114686	.125035	.135198	.144804	.153601
0.6	.132517	.142909	.153527	.163950	.173831
0.7	.149865	.160195	.171069	.182061	.192765
0.8	.166839	.177046	.188053	.199437	.210764
0.9	.183511	.193568	.204628	.216279	.228076
1.0	.199944	.209835	.220893	.232721	.244873

Q_{20}

α \ β	0.1	0.2	0.3	0.4	0.5
0.1	.065834	.075614	.081302	.084930	.087412
0.2	.112296	.128394	.140458	.149524	.156432
0.3	.153712	.172662	.188898	.202464	.213662
0.4	.192432	.212642	.231430	.248302	.263078
0.5	.229372	.250070	.270396	.289608	.307202
0.6	.265034	.285818	.307054	.327900	.347662
0.7	.299730	.320390	.342138	.364122	.385530
0.8	.333678	.354092	.376106	.398874	.421528
0.9	.367022	.387136	.409256	.432558	.456152
1.0	.399888	.419670	.441786	.465442	.489746

VITA

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Master of Science

Thesis: MOMENT COEFFICIENT TABLES FOR ONE AND TWO SPAN GABLE FRAMES

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