# PART ONE: SECONDARY MOMENTS IN BUILDING BENTS DUE TO COLUMN SHORTENING

## PART TWO: PRIMARY AND SECONDARY MOMENTS IN A BUILDING BENT DUE TO FOUNDATION SETTLEMENT

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#### PRELIMINARY:

The Hardy Cross method of distributing fixed end moments was employed. The directional convention of moment sign is used, that is, a moment which rotates a joint clockwise is positive. On the summary sheets, all lengths are in inches (unless otherwise specified) and all moments are in inch-kips.

The first part of this paper contains the conclusions and the summarizing sheets for both parts of this thesis as well as a copy of a discussion on 'Wind-bracing in Buildings' submitted to the 'Proceedings of the American Society of Civil Engineers' by V. A. Vanoni and the writer. The second part is made up of computation sheets.

#### PART ONE

#### SECONDARY MOMENTS IN BUILDING BENTS

#### DUE TO COLUMN SHORTENING UNDER HORIZONTAL LOADS

The primary purpose of this investigation was to determine for a particular building bent the importance of secondary moments due to column shortening. It was also desired to obtain criteria for predicting the probable importance of such secondaries.

The twenty-story, three-bay bent analyzed in Bulletin 80 of the University of Illinois was selected for investigation.

In this investigation the foundations of the bent were assumed firm, no settlement was considered. Any such movement would tend to increase the secondary moments. The second part of this discussion deals with the effect of settlement of alternate columns of a bent.

Starting with no displacement at the foundations the cumulashortening tive column in each column at each floor was determined. The fixed end moments (bending moments which would result from differential vertical movement of the ends without rotation) of the girders were computed and distributed by the Hardy Cross Method.

Summary sheet #1 outlines the procedure and gives all data necessary to obtain fixed end girder moments. All values are

obtained directly or indirectly from Bulletin 80 (University of Illincis).."P" is the column load in pounds, tension on one side of the center-line. compression on the other. Under "h" are given column lengths between floors, in inches. "A" is the column area I is the girder moment of inertia in inches . in inches . L is the girder length squared in inches<sup>2</sup>, while M<sub>c</sub> is the fixed end girder moment in inch-pounds. Referring to the diagram on summarytsheet #2, "d" is the cumulative differential column shortening "d " is the difference between the cumulative shortat any story. ening (or lengthening) of columns "A" and "B". "d" is twice the cumulative shortening of column "B". The computations give expressions for "M<sub>fa</sub>" and "M<sub>fb</sub>" in terms of I, L, P, h, and A.

The fixed end moments thus obtained were applied to the girders and distributed by the Hardy Cross Method, taking account of sidesway. Because of the proportions of the bent sidesway was considerable and seven cycles were required before satisfactory approach to equilibrium obtained.

The final moments obtained were surprising to say the least, and at first very disappointing. In general their magnitudes were of the order of the probable accuracy of the computations. In other words the moments obtained were probably accurate within several hundred percent. The relatively largest final girder moment was only eleven percent of the original fixed end moment. Summary sheets #2, #3, #4, give the primary.moments (not the fixed end moments) and the resulting secondary moments. It must be remembered that these values are not exact and do no more than give

the order of magnitude of the secondary moments.

The value of this investigation is not immediately obvious. In fact it seems a waste of time to spend a term discovering that the secondary moments in a building bent are negligeable. V.A.Vanoni, making the same investigation on a different bent, found very large secondary moments, sometimes even greater than the original wind moments, and generally about half as great. Apparantly secondary moments are not always negligeable.

The question immediately arises: Can we know beforehand whether or not secondary moments require consideration? The present investigation furnishes a clue to the answer.

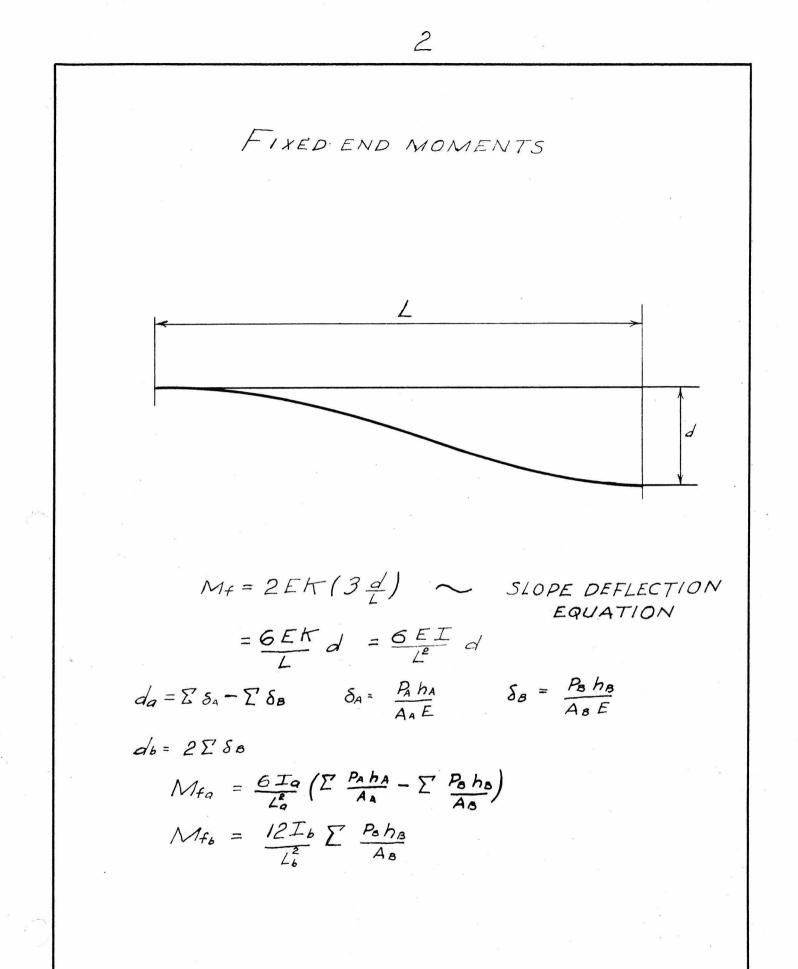
In the bent under discussion the column stresses on one side of the center-line of the bent are of the same sign, and the column stress and therefore the column shortening is roughly proportional to the distance from the center-line. Obviously when equilibrium is reached the bent will have moved a considerable distance sidewise but the girders will be nearly straight.

In Mr. Vanoni's bent, on the other hand, the columns are alternately in tension and compression, so that the girders are subjected to considerable bending. Sidesway is small but column and girder moments are large.

There is included a discussion submitted to the "Proceedings of the American Society of Civil Engineers" by V.A. Vanoni and the writer.

This discussion includes a diagram summarizing the results obtained by Mr. Vanoni. The reader is also referred to Mr. Vanoni's Thesis.

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PRIMARY WIND MOMENTS AND SECONDARY

### PRIMARY WIND MOMENTS AND SECONDARY MOMENTS DUE TO COLUMN SHORTENING

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#### WIND-BRACING IN STEEL BUILDINGS

#### DISCUSSION

A rather sketchy investigation disclosed only one reference to the subject of Secondary Stresses in building bents due to column shortening under wind-load. Bulletin 80 of the University of Illinois covers the subject in a paragraph. The shortening of the first story columns of the twenty-story bent is computed and the fixedend moments in the first story girders determined. These moments are small compared with the original wind moments. However, it must be remembered that the effect of column shortening is cumulative from bottom to top, while the girder moments due to wind become smaller so that the effect of column shortening should be much greater at the top than near the ground.

In its discussion the Committee on Wind-Bracing states that in the case of a high, narrow building secondary moments require investigation. In the relatively high and narrow Wilson-Maney bent secondary moments are negligible. Apparantly there is another criterion. The importance of secondary moments depends upon the relative size of bays and upon the relative stiffness of columns and girders. In the Wilson-Maney bent both columns on one side of the center line have the same kind of stress under wind load and this stress and therefore the shortening is roughly proportional to the distance from the center line. Since all the fixed-end moments in the girders due to column shortening act in the same direction, they will all be reduced by the resulting sidesway and the girders in their final position (after equilibrium is reached) will be nearly straight. When we have alternate tension and compression in the columns, the girders are constrained and may therefore have large bending moments after equilibrium is reached. In such a case sidesway will increase certain girder moments and decrease others.

The committee does not consider the possibility that the secondary moments as first obtained may require correction. For example, in general (not always) the secondary moments in the girders will be opposite to the primary moments. If the secondaries are large, say 50% of the primaries, the resultant moments will be one-half of the original. But the secondaries will also produce column shortening which will cause more secondary moments, ordinarily of the same sign as the primary moments. If the first secondaries are 50% of the primary moments then the second secondaries will be about 25% of the primary moments which will make the resulting moments 75% of the original moments instead of 50%.

In general the first secondary moments will give results which, for girders, are on the unsafe side.

Calculations were made on two bents; one, the twenty story Wilson-Maney bent, gave negligible secondary moments. The other bent, which was obtained by adding twenty-two foot bays to the

upper ten stories of the Wilson-Maney bent, gave very interesting results. Under wind loads the columns of this bent were alternately in tension and compression. The accompanying diagram gives the ratio of the first secondary to the original wind moments (lower figure), and the ratio of the secondary moment after two corrections (algebraic sum of secondary plus first correction plus second correction) to the original moment.

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M.P. White, Assistant in Civil Engineering, California Institute of Technology

### RATIOS OF FIRST SECONDARY MOMENTS AND CORRECTED SECONDARY MOMENTS TO WIND MOMENTS

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#### PART TWO

#### PRIMARY AND SECONDARY MOMENTS IN A BUILDING BENT

#### DUE TO FOUNDATION SETTLEMENT

In connection with the first part of this investigation it was decided to find the effect of column settlement. Because of the short time available a very simple bent was selected, the upper six stories of an interior bay of the Insurance Exchange Building in Los Angeles. This building is of reinforced concrete. All essential dimensions are given on the summarizing diagram.

Fixed end moments resulting from one-quarter inch settlement of alternate footings were calculated and distributed by the Hardy Cross Method. The assumption of one-quarter inch differential settlement is certainly pessimistic, but is not an impossibility. In any case the effect would be proportional to the displacement.

The final moments thus obtained are much greater in the center than in the exterior bays. Dead load moments and wind load moments (assuming thirty pounds per square foot) had previously been determined for this bent. In the exterior panels the moments due to footing settlement were about equal to dead load moments and to wind load moments, but in the interior panel the moments due to settlement were from two to three times the dead load or wind load moments.

The next step was the calculation and distribution of fixed end moments due to column shortening. The final moments obtained by this process of course are correction moments for the original moments. They are of opposite sign and therefore, if neglected, constitute a factor of safety. They vary from about eight percent at the bottom to about thirty-five percent at the top of the bent.

Unlike secondary moments due to wind loads, moments due to footing settlement and the resulting secondary moments do not depend on the characteristics of the bent for their importance (except that they increase directly with stiffness of members). They are primarily a linear function of the settlement.

## PRIMARY AND SECONDARY MOMENTS

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I. in

Moments in a Building Bent due to

Fixed-end Gir	der Momen	ts: due to	4ª settlement,
$M_{f} = 2EK(-3d)$ $K = \overline{I}$	$=\frac{K}{I} \times 6 \times 3$	×106.1 =	3 K in 160 (106)
K= Į	L		2
All moments	exp. in 10	6 in 160.	

		AB			BC	
Floor	K	L	ME	K	L	M¢.
6	181	283	1.92	175	204	2.57
5	290	283	2.55	205	204	3.02
9	290	283	2.55	205	201	3.02
3	240	283	2.55	202	204	3.02
2	-2 40	283	2.55	205	204	3.02
1	290	283	2.55	205	209	3.02
	방법을 변경할 때					

See sheets 2.3.4 for determination of final moments.

C	olumn Str	ess es.	Col. 1	3
	Z Maird. (A 13) 1.76		Z Moin (BC) -3,50	P(163) + 17140
	4,26	- 15050	- 8.52	+ 41750
4	7.4 1	- 26200	-14,78	+ 72500
3	10.68	- 37700	-21,28	+ 104300
2	13,41	- 47400	- 26.7.0	+ 131000
1	16,38	- 57800	- 92.60	+ 160,000

				4			
Joint	6 /	7		6	3		
Mem.	6.A.5		AGB	BLA	BbC	NIPI	635
IK St.	,245		1.00			1°	. 2 5 5
			,875	.473	,456		
K joint	,1256		+1.92				,071
Mf Balij.	211			+1.92 +.31	-2.57 +,30		+.04.
C.O.	24		-1.68		4.15		+,01
5.3	- 10		4.15	84			
BJ.	02	V	17	+.26	4.24		+.14 +.04
00	01				+.12		+.02
55	01		4.13	-108	TVIC	At	02
BJ.			10		02		The second s
00	- 101			02			0
53	· 0 .+.01		01	=. 05	01		01
[B.).	0		0	+.03	+103		4.01
Co	0		+.0/	0			0
55	0		7.01	0	+101		0
B.).							and the second
00	0		-101	01	0		0
- oK							
	- ,24	F 11	4,24	+1.52	1-1.75		4.23
Joryt	- 01	5 A	1.50	0 - 0	5B		=10 /
Mem.	5.A6	5A4	ATB	B5A	BSC	5134	5136
K/EKStow	.245	245				1255	:255
IT joint	1080	1163	.755	1455	, 390	100	.055
MF			+2.55	+2.55	-3.02		
BJ	20	-, 42	-1.93	+.21	+.18	4.05	7.03
CO	12	-118	+ 10	96	+.09	1.02	4102
<u>SS</u>	+.14	+. 25				+127	f.14
B.J.	02	03	14	+128	4.29	+.06	4.04
CO	01	0/	4.14	07	+112	+.00	+.02
35	01	0					
185	01	02	-108	02	02	0	0
co	0	0	0/	04	01	0	+.01
52 B.J.	+10/	4.0/		4.01	+,0.1	4.01	0
00	0	0	01	0	0	0	0
53	0	0			1	01	0
BJ		0	0	0	0	0	0
ras,				09	08	02	01
BJ,			04	0	04	1,9,11	
		- +101	11.03	+.02	+ 102		
				TILLET			
617	-, 22	39	+.61	+1.89	-2.51	+,39	+.23

Col. 37 B Col. 27 PAL PBL E (PA + PB) & MEAB Z Poh MFBC AA Floor h Eq. Area. gross 16165 6 149" 11330 144.710-555.000 4110 218 218 111,160 +1,195,000 5 14130, 129,270-796 133" 336 5470 000 99830 41,203,000 360 4 486 109,670,-674 26100 186" 516 10,000 000 85.700 41,033,000 3 82,570 -508 59,600 + 719 000 000 666 7390 624 19100 133 2 56.050 345 133 807 + 488 000 000 758 7630 19800 40,500 1 , 23 887 9.42 28.650 -176 000 + 249 000 20. 799 7950 30700 0 Girder 818

due to column shortening, Fixed end, Moments Mf =12 K (106) d (in 165) d = : cumulative Col. Jhortening  $M_{f} = \frac{12T}{L}(106) \sum \left(\frac{P_{ah}}{A_{aE}} + \frac{P_{Bh}}{A_{DE}}\right)$  $= \frac{1215h106}{L.2.106} \sum \left(\frac{P_{A1}}{A_{B}} + \frac{P_{B}}{A_{B}}\right) = \frac{617}{L} \sum \left(\frac{P_{A}}{A_{B}} + \frac{P_{B}}{A_{B}}\right)h$  $M \in BC = \frac{12\kappa}{K} \left( \sum \frac{PB}{AB} h \right)$ 

Joint		.4. A			4	B	
Memb	4A3	4A5	A4B	B4A	134C	4 B5	4133
()茶到,	,242	,245				,255	.258
15 EK 10.	.206	,141	.653	,415	,355	,090	.140
Me			+2.55	+2.55	-3.02		
13.7	52	-136	-1.67	4.20	+.17	4.04	+.06
Co	20	21	+ . 10	83	30.4	+.02	+,03
SS	+,29	+.25				+.27	+.31
BJ.	-0.05	03	15	+, 05	1.04	+.01	1.02
co	02	01	+.02	07	4.02	4.03	0.1
55	+.03	0				01	4.04
BJ	0	0	02	0	0	0	0
00	0	_, 0 ]	0	- , 01	0	0	0
35	0	+.01				+,01,	0
BJ,	0	0	0	0	0	0	0
C0 55	0	0			0	0	0
BJ	. 0	0	0	0	0		
Co	0	0	0	0	0	0	0
BJ.				+.01			
710	- ,47	- ,36	+,83	+1:96	-2.71	+.36	+ , 45
Joint		3 A			3	ß	
Memb.	3 4 4	3A2	ABB	B3A	1330	382	3BQ
Ex 340,	1242	1243				, 257 .	.258
EK Joiit	,161	,339	.510	.348	,297	,238	.117
ME			+2.55	+2.55	-3.02		
13.3.	- , 4)	84	-1.30	+.16.	+ ./4	4,1,	4.06
Co	-,26	3/	4.08	- 165	+107	4.04	+, 03
32	+.29	4.46				4.49	4.31
B.J.	-104	09	13	- 10	09	07	03
00	02	- 103	05	06	04	4.14	+.01
50	+103	4.13	03		-10/	0	+.04
B)	01	02	0	01	-101	01	0
00	0	+.03		01		+,03	0
55	0		01			-	
BJ	0	0	01	-10/	0	0.0	0
CO	0	0		0	0	101	0
53	0	0		1+++++++			
BJ	0	0	0	-10/	0	0.	0
			math				
		.1					
OK	- 12	- 19	111	11.00		1,7	1 1 -
C Int 1	-,42	-,69	-11.11	17186	-2.95	4.67	1 +, 42

				0			
Joint		2A			DB		
Mew	2A1	2A3	AZB	B2A	B2C	2 B3	2131
- 芋下 5t.	,246	.243				.257	,25¥
Ērj	.368	,248	,384	.283	1242	,194	. 281
Mf			-,345	-, 34	+149		
© J	4.13	-1.08	4.13	04	04'	-,03	04
CO	+.02	4.08	-102	4.06	02	02	01
53	04	06				-,07	04
BJ.	4.01	0	1101	+.03	+102	4.02	4:03
CO	0	9	+,01	0	+101	0	1:02
53	02	-10/				-102	02
BJ	1.01	0	+101	1.01	0	0	0
P							
	+, 11	1.0.9	20	28	+ 46	-,12	06
Joint		1A				B	
Meur	1A2	140	AIB	1314	BIC	IBD	1B2
Marst.	.246	.246				, 254	,254
MEN J	, 293	. 401	,306	,237	1202	, 326	.235
ME			185	18	+, 25		
BI	1.65	1.07	4.06	02	-,01	-,02	02
co	+.06	1.03	01	4.03	0	-,01	+.02
33	04	03				04	-105
B.J.	0	01	0	+ 102	1.02	+103	1.62
Co	9	0	+.01	0	+,01	+10/	4.01
3.5	02	01					03
B.J.	0	+101	7.01	4.01	0	4.01	0
						+++++	
	1.05	1.06	-,11	14	+127	04	09
Contraction of the second	THE PARTY	The Part			THEFT		

Joint		4A			4 B		
Mem	4A3	4A5	A4B	B4A	B4C	4B5	4133
Er St.	,242	. 245-				,255	1258
Ex j	,206	,141	.653	. 415	,355	,090	.140 .
MF			67	67	+1.03		
Bj	+ , 14	1.09	1,44	- 115	13	- , 03	-, 05 .
co	1.04	+,06	08	+.22	06	- :02	-101
53	05	- 105				06	0.6
B.J.	7.02	4.01	1.05	- 10/	0	0	. 0
60	0	0	0	1103	+,01	0,	- 0
5.S.	01	0				01	-10/
BJ.	0	0	4.01	01	0/	0	0
there							
				* i*			
	+,14	+,11	25	-,59	+.84	-12	13
Joint		3A			3B		and the second se
Joint		) A			20		
Mem	3A4	JA JA2	ABB	BAB	B3 C	3.82	3/34
Mem	3A4 1242	and the second sec	ABB	13,43		3B2 .257	3/34
		3A2	A3B ,510	13/43 · 348			
Mem	,242	3A2 .243			B3 c	.257 .238	1117
Mem Er st. Er s	1242	3A2 .243	,510	.348	133 C , 297	.257 .238 05	· 258 · 117 03
Mem Er st. Er s Mf	,242	3A 2 .243 3.329	,510 + 151	.348	133 C , 297 4, 72	.257 ,238 05 01	;258 :117 03 02
Mew Er st. Er s Mf BJ CO 35	,242 ,161 (* 1.08	3A 2 .243 3.329 4,17	,510 - 151 - 1.26	·348 - ·51 - ·07	133 C ; 297 4;72 -,06	.257 .238 05 01 07	;258 ;117 03 02 06
Mem Er st. Er st. Mf BJ CO	, 242 , 161 (4) +, 08 +, 07	3A2 .243 3.329 +,17 +,04	,510 - 151 - 1.26	-348 -151 -107 4.13 -102	133 C ; 297 4;72 -,06	.257 .238 05 01 07 +.01	;258 ;117 03 02 06 +.01
Mew Er st. Er s Mf BJ CO 35	, 242 , 161 (# +, 08 +, 07 -, 05	3A 2 .243 3.329 +117 +104 06	,510 - 151 - 1.26 04	·348 - ·51 - ·07 + ·13	133 C 1,297 1,72 -,06 -103	.257 .238 05 01 07 +.01 +.01 +.01	:258 :117 -:03 02 06 +:01 0
Mrw Er st. Er st. Mf BJ CO SS BJ.	, 242 , 161 (8) +, 08 +, 07 -, 05 +, 01	3A 2 .243 3.329 +117 +104 06 +101	,510 -151 -1.26 04 +1.02	-348 -151 -107 4.13 -102	133C ,297 4,72 -,06 -103 1102	.257 .238 05 01 07 +.01	;258 ;117 03 02 06 +.01
Mrw Er st. Er st. Mf BJ CO SS BJ.	1242 161 4 1.08 1.07 05 100 100	3A 2 .243 3.329 +.17 +.09 06 +.01 0	,510 -151 -1.26 04 +1.02	-348 -151 -107 4.13 -102	133C ,297 4,72 -,06 -103 1102	.257 .238 05 01 07 +.01 +.01 +.01	:258 :117 -:03 02 06 +:01 0
Mrw Er st. Er st. Mf BJ CO SS BJ, CO	1242 161 4 1.08 1.07 05 101 101 101 -101	3A 2 .243 3.329 +117 +104 06 +101 0 -101	,510 -1.36 04 +.02 +.07	-348 -151 -107 +13 -102 +102 +101	133C ;297 4;72 -,06 -,03 1:02 0	.257 .238 05 01 07 +.01 +.01 +.01 +.01	:258 :117 -:03 02 02 +:01 0 -:02
Mrw Er st. Er st. Mf BJ CO SS BJ, CO	1242 161 4 1.08 1.07 05 101 101 101 -101	3A 2 .243 3.329 +117 +104 06 +101 0 -101	,510 -1.36 04 +.02 +.07	-348 -151 -107 +13 -102 +102 +101	133C ;297 4;72 -,06 -,03 1:02 0	.257 .238 05 01 07 +.01 +.01 +.01 +.01	:258 :117 -:03 02 02 +:01 0 -:02
Mrw Er st. Er st. Mf BJ CO SS BJ, CO	1242 161 4 1.08 1.07 05 101 101 101 -101	3A 2 .243 3.329 +117 +104 06 +101 0 -101	,510 -1.36 04 +.02 +.07	-348 -151 -107 +13 -102 +102 +101	133C ;297 4;72 -,06 -,03 1:02 0	.257 .238 05 01 07 +.01 +.01 +.01 +.01	:258 :117 -:03 02 02 +:01 0 -:02
Mrw Er st. Er st. Mf BJ CO SS BJ, CO	1242 161 4 1.08 1.07 05 101 101 101 -101	3A 2 .243 3.329 +117 +104 06 +101 0 -101	,510 -1.36 04 +.02 +.07	-348 -151 -107 +13 -102 +102 +101	133C ;297 4;72 -,06 -,03 1:02 0	.257 .238 05 01 07 +.01 +.01 +.01 +.01	:258 :117 -:03 02 02 +:01 0 -:02
Mrw Er st. Er st. Mf BJ CO SS BJ, CO	1242 161 4 1.08 1.07 05 101 101 101 -101	3A 2 .243 3.329 +117 +104 06 +101 0 -101	,510 -1.36 04 +.02 +.07	-348 -151 -107 +13 -102 +102 +101	133C ;297 4;72 -,06 -,03 1:02 0	.257 .238 05 01 07 +.01 +.01 +.01 +.01	:258 :117 -:03 02 02 +:01 0 -:02
Mrw Er st. Er st. Mf BJ CO SS BJ, CO	1242 161 4 1.08 1.07 05 101 101 101 -101	3A 2 .243 3.329 +117 +104 06 +101 0 -101	,510 -1.36 04 +.02 +.07	-348 -151 -107 +13 -102 +102 +101	133C ;297 4;72 -,06 -,03 1:02 0	.257 .238 05 01 07 +.01 +.01 +.01 +.01	:258 :117 -:03 02 02 +:01 0 -:02
Mrw Er st. Er st. Mf BJ CO SS BJ, CO	1242 161 4 1.08 1.07 05 101 101 101 -101	3A 2 .243 3.329 +117 +104 06 +101 0 -101	,510 -1.36 04 +.02 +.07	-348 -151 -107 +13 -102 +102 +101	133C ;297 4;72 -,06 -,03 1:02 0	.257 .238 05 01 07 +.01 +.01 +.01 +.01	:258 :117 -:03 02 02 +:01 0 -:02
Mrw Er st. Er st. Mf BJ CO SS BJ, CO	1242 161 4 1.08 1.07 05 101 101 101 -101	3A 2 .243 3.329 +117 +104 06 +101 0 -101	,510 -1.36 04 +.02 +.07	-348 -151 -107 +13 -102 +102 +101	133C ;297 4;72 -,06 -,03 1:02 0	.257 .238 05 01 07 +.01 +.01 +.01 +.01	:258 :117 -:03 02 02 +:01 0 -:02
Mrw Er st. Er st. Mf BJ CO SS BJ, CO	1242 161 4 1.08 1.07 05 101 101 101 -101	3A 2 .243 3.329 +117 +104 06 +101 0 -101	,510 -1.36 04 +.02 +.07	-348 -151 -107 +13 -102 +102 +101	133C ;297 4;72 -,06 -,03 1:02 0	.257 .238 05 01 07 +.01 +.01 +.01 +.01	:258 :117 -:03 02 02 +:01 0 -:02
Mrw Er st. Er st. Mf BJ CO SS BJ, CO	1242 161 4 1.08 1.07 05 101 101 101 -101	3A 2 .243 3.329 +117 +104 06 +101 0 -101	,510 -1.36 04 +.02 +.07	-348 -151 -107 +13 -102 +102 +101	133C ;297 4;72 -,06 -,03 1:02 0	.257 .238 05 01 07 +.01 +.01 +.01 +.01	:258 :117 -:03 02 02 +:01 0 -:02

a for the second second				2			
Joint		ZA			5	B	
Memb	) A (	2 A 3	AZB	BZA	BZC	233	231
× 11 34.	.246	.243				,257	,254
IT jo.	. 368	.248	:384	,283	,242	,1949	. 2.8.1
ME			+ 2.55	+2.55	-3.02		
· B'1	- 194	63	- 198	+.13	+ . 12	4.09	+.13
C.O.	- 137	- 142	. + . 06	49	+ 106	4.05	4.05
33	1.54	+.46				+,49	+,55
BJ.	10	07	-,10	- 120	17	-114	20
C.O.	03	04	10	01	08	03	12
35:00	+,22	+.13				+r14	4.23
151.	07	04	07	03	-102	-102	-102
co	04	01	01	03	0 /	0	-102
35.	1.08	+.03				+.03	4.08
. B,J.	- 102	01	-102	-102	-101	01	01
Co	-101	0	-101	- :01	.0	0	- 101
53	7.03	0				+:01	1.03
B.J.	0	0.	-101	-101	0	0	-101
C 0 35 0K	0,1	<u>a</u>		0			
	- 171	-,60	+1.31	+1.84	-3.13	+.61	+.68 ?
Joint		1 A				B	
Meyb.	1A2	IAO	AIB	BIA	BIC	136	132
K Sto.	1246	.246			<b>SERAND</b>	,254	,254
Er Sout	.293	.401	,306	,237	. 292	.326	,235-
Me			+2.55	42.55	-3.02		the state of the s
BD.	75	- 1.02	- 178	+ 11	+.100	+.15	+. ) /
C.o.	47	51	+105	39.	+.05	.1:07	1.06
53	4.54	+ 164				+.67	4.55
· B.J.	07	- ,10	- 108	24	20	33	24
C.O.	05	05	- 112	04	-110	16	10
5.3.	+,22	+.31				+.33	+,23
RJ.	09	12	10	04	03	-105	04
co	03	06	- 102	- 105	01	02	- 101
\$\$.	+.08	+,12				+,13	4,08
13, ),	02	04.	-103	- 103	02	04	- 10 3
Co	01:	-102	01	01	12.01	-102	0
55	1.03	1.06	+++++++++++++++++++++++++++++++++++++++			1.06	1103
B.J.	01	- 102	-:02	01	- 10 /	-102	
co	0	-101 +103	0	-01	0	1-104	+.01.
55 B.J.	+.01					1:03	
B.J.	0./	-101	0/		0	01.	
014	-,63	80	+1:43	+1.84	- 3,25	4.78	1163

				8			
Joint		6 A			61	3	1 24 2 1 4 2 3
Mehr	6A 5.	<u> </u>	AGB	136A	BGC		6B5
H. J.	. 295					THEFT	, 255
Ar j	.125		,875	, 473	,456		1071
Mf			55	55	+1.15	K.	
BJ	+.07		4.48	28	- 128		04
Co	+.03		- 14	4.24	14		01
SS	62						-103
BJ.	+,02		+.11	4.03	03		0
co	0		-102	+.06	01		0
3.5.	01						01
BJ.	101		1.03	03	-102		0
7							
	+.09		09	-,58	+.67		09
loiut		5A				В	
Joint		5A 5A4		B5A	51		586
Mein	5A6	5A4	A50	B5A		B 5-B4 ,255	5136
Mein Eir sti	5A6 1245	5A4 1245	A50		51 B5C	5B4 .255	,255
Men Err st. Err s	5A6	5A4	A50 ,755	, 455	51 B5C .390	5B4	States and the state of the second states where the second states are the second states and the second states are the second states
Mem Krist. Kris Mf	5A6 1245	5A4 ,245 ,165	A50 .755 - 180	. 455 80	51 1350 .390 +1,20	5B4 .255	,255
Mem <u>Kristi</u> Zirsti Mf Bij	5A6 1245 1080	5A4 1245	A50 ,755	, 455	51 B5C .390	5-13-4 .255 .100	,255
Mem <u>K</u> ensti <u>Ens</u> ti Mf BJ CO	5A6 1245 1080 1106	5A4 ,245 ,165 +,13	A50 .755 80 +.61	. 455 80 18	51 B5C .390 +1.20 16.	5-13-4 .255 .100 -104	,255 ,055 02
Mem <u>K</u> ir st. <u>K</u> ir s M f BJ CO JS	5 A 6 ,245 ,080 +,06 +,03	5A4 ,2V5 1165 +.13 +.04	A50 .755 80 +.61	. 455 80 18	51 B5C .390 +1.20 16.	5-13-4 .255 .100 -104 -101	,255 ,055 02 02
Mem <u>K</u> rst. <u>K</u> rs Mf BJ CO JS B,J.	5A6 1245 1080 1106 1103 -102	5A4 ,245 1165 +.13 +.04 05	A50 .755 80 +. 61 09	.455 80 18 +.32	51 1350 .390 +1,20 16 08	5-13-4 .255 .100 -104 -101 -106	,255 ,055 02 02 03 01 0
Mem <u>K</u> ir st. <u>K</u> ir s M f BJ CO JS	5A6 1245 1080 1106 1103 02 1101	5A4 ,245 1165 4.13 4.04 05 4.01	A50 .755 80 +.61 09 +.07	.455 80 18 1.32 05	51 B5C .390 +1.20 16 08 05	5-13-4 .255 .100 -104 -104 -101 -106 -101	,255 ,055 02 02 02 03 01
Mem Kit st. Kit s M f BJ CO DS BJ CO DS BJ CO	5 A 6 1245 1080 1106 1103 103 102 101 101 101 101 0	5A4 ,2V5 1165 +.13 +.04 05 +.01 0	A50 .755 80 +.61 09 +.07	.455 80 18 1.32 05	51 B5C .390 +1.20 16 08 05	5-13-4 .255 .100 -104 -104 -101 -106 -101 0	,255 ,055 02 02 03 01 0 01
Mem Kenst. Keirst. Mf BJ CO DS BJ. CO DS BJ. CO DS	5A6 1245 1080 1106 1103 02 1101 1.01 1.01	5A4 ,2V5 1165 +.13 +.04 05 +.01 0 0	A50 .755 80 4.61 09 +.07 03	.455 80 18 +.32 05 +.04	51 B5C .390 +1.20 16 08 05	5-13-4 .255 .100 -104 -104 -101 -106 -101 0	,255 ,055 02 02 03 01 0 01
Mem Kenst. Keirst. Mf BJ CO DS BJ. CO DS BJ. CO DS	5 A 6 1245 1080 1106 1103 103 102 101 101 101 101 0	5A4 ,2V5 1165 +.13 +.04 05 +.01 0 0	A50 .755 80 4.61 09 +.07 03	.455 80 18 +.32 05 +.04	51 B5C .390 +1.20 16 08 05	5-13-4 .255 .100 -104 -104 -101 -106 -101 0	,255 ,055 02 02 03 01 0 01
Mem Kenst. Keirst. Mf BJ CO DS BJ. CO DS BJ. CO DS	5 A 6 1245 1080 1106 1103 103 102 101 101 101 101 0	5A4 ,2V5 1165 +.13 +.04 05 +.01 0 0	A50 .755 80 4.61 09 +.07 03	.455 80 18 +.32 05 +.04	51 B5C .390 +1.20 16 08 05	5-13-4 .255 .100 -104 -104 -101 -106 -101 0	,255 ,055 02 02 03 01 0 01
Mem Kenst. Keirst. Mf BJ CO DS BJ. CO DS BJ. CO DS	5 A 6 1245 1080 1106 1103 103 102 101 101 101 101 0	5A4 ,2V5 1165 +.13 +.04 05 +.01 0 0	A50 .755 80 4.61 09 +.07 03	.455 80 18 +.32 05 +.04	51 B5C .390 +1.20 16 08 05	5-13-4 .255 .100 -104 -104 -101 -106 -101 0	,255 ,055 02 02 03 01 0 01
Mem Kenst. Keirst. Mf BJ CO DS BJ. CO DS BJ. CO DS	5 A 6 1245 1080 1106 1103 103 102 101 101 101 101 0	5A4 ,2V5 1165 +.13 +.04 05 +.01 0 0	A50 .755 80 4.61 09 +.07 03	.455 80 18 +.32 05 +.04	51 B5C .390 +1.20 16 08 05	5-13-4 .255 .100 -104 -104 -101 -106 -101 0	,255 ,055 02 02 03 01 0 01
Mem Kirst. Kirst. Mf BJ CO DS BJ. CO DS BJ. CO DS	5 A 6 1245 1080 1106 1103 103 102 101 101 101 101 0	5A4 ,2V5 1165 +.13 +.04 05 +.01 0 0	A50 .755 80 4.61 09 +.07 03	.455 80 18 +.32 05 +.04	51 B5C .390 +1.20 16 08 05	5-13-4 .255 .100 -104 -104 -101 -106 -101 0	,255 ,055 02 02 03 01 0 01
Mem Kirst. Kirst. Mf BJ CO DS BJ. CO DS BJ. CO DS	5 A 6 1245 1080 1106 1103 103 102 101 101 101 101 0	5A4 ,2V5 1165 +.13 +.04 05 +.01 0 0	A50 .755 80 4.61 09 +.07 03	.455 80 18 +.32 05 +.04	51 B5C .390 +1.20 16 08 05	5-13-4 .255 .100 -104 -104 -101 -106 -101 0	,255 ,055 02 02 03 01 0 01
Mem Kirst. Kirst. Mf BJ CO DS BJ. CO DS BJ. CO DS	5 A 6 1245 1080 1106 1103 103 102 101 101 101 101 0	5A4 ,2V5 1165 +.13 +.04 05 +.01 0 0	A50 .755 80 4.61 09 +.07 03	.455 80 18 +.32 05 +.04	51 B5C .390 +1.20 16 08 05	5-13-4 .255 .100 -104 -104 -101 -106 -101 0	,255 ,055 02 02 03 01 0 01
Mem Kirst. Kirst. Mf BJ CO DS BJ. CO DS BJ. CO DS	5 A 6 1245 1080 1106 1103 103 102 101 101 101 101 0	5A4 ,2V5 1165 +.13 +.04 05 +.01 0 0	A50 .755 80 4.61 09 +.07 03	.455 80 18 +.32 05 +.04	51 B5C .390 +1.20 16 08 05	5-13-4 .255 .100 -104 -104 -101 -106 -101 0	,255 ,055 02 02 03 01 0 01