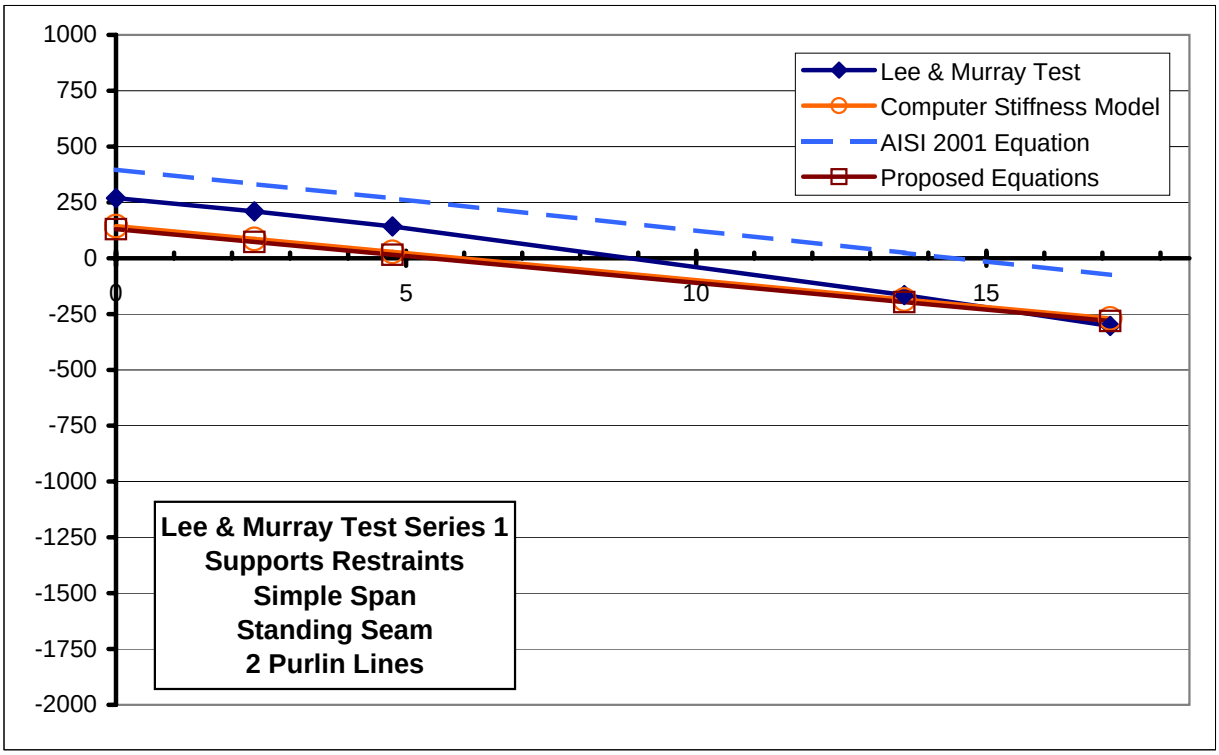
APPENDIX A:
COMPARISON OF PREDICTIONS TO LEE AND MURRAY TESTING

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 1
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8Z0.060
Bracing Configuration: Supports

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	269	144	397	130
2.39	210	86	333	73
4.76	143	28	268	15
13.59	-165	-185	24	-197
17.14	-304	-270	-74	-281



Input Summary:

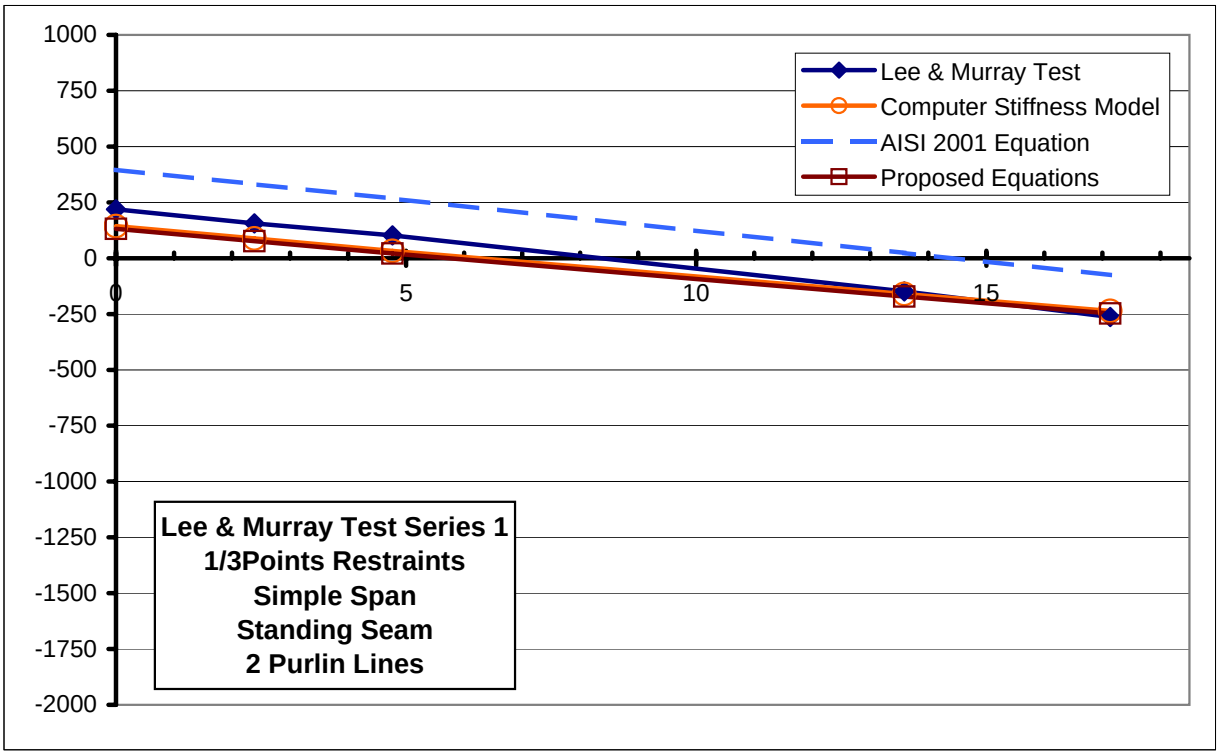
Ref Node	101103	SupRestraints	1@1-2	PanelConnStiff	1500
Index	1	1_3Restraints	--	TribFirst	3.5
Load_	20.00 psf	1_4Restraints	--	TribLast	3.5
RestraintType1	64.712kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	64.712kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Lee1	PanelIx	0.039	InactiveTruss	FALSE
Spaces	1@4.833	ClipStiffness	100000	Notes	Lee - Series 1

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 1
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8Z0.060
Bracing Configuration: 1/3Points

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	219	144	396	131
2.39	156	88	332	76
4.76	103	33	267	21
13.59	-149	-160	23	-172
17.14	-263	-236	-75	-248



Input Summary:

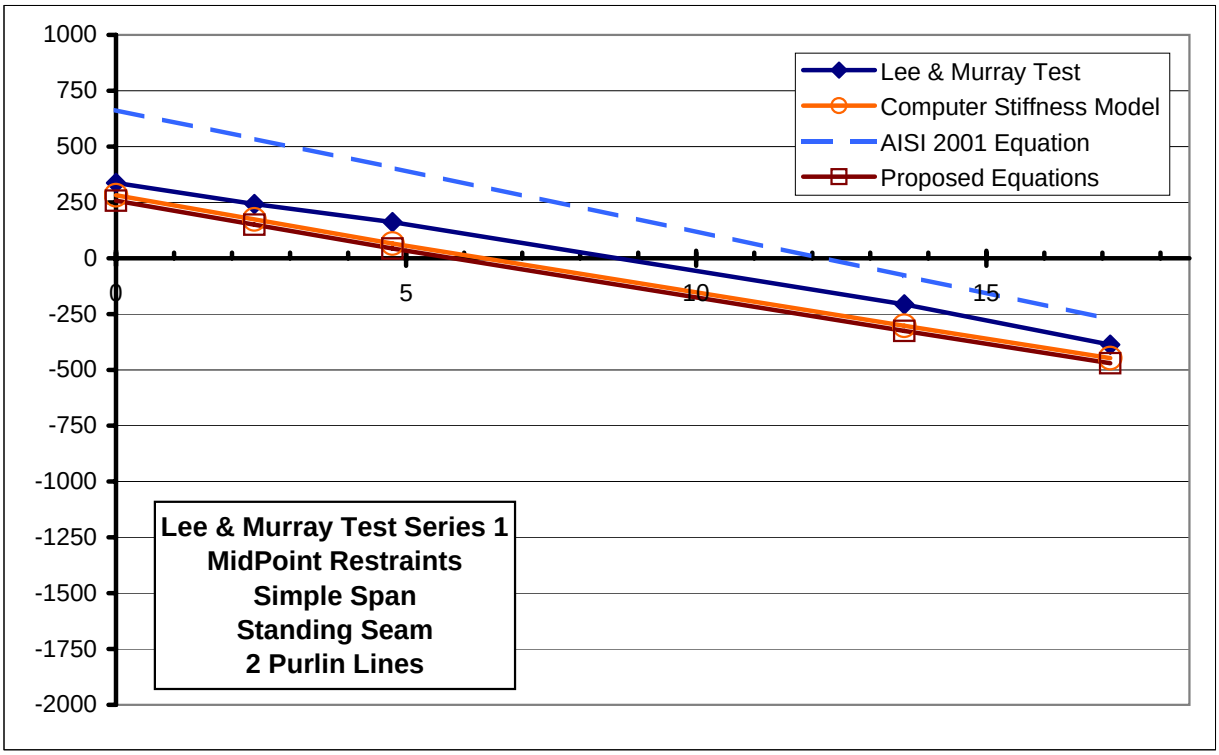
Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	6	1_3Restraints	1@1	TribFirst	3.5
Load_	20.00 psf	1_4Restraints	--	TribLast	3.5
RestraintType1	10.923kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	10.923kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Lee1	PanelIx	0.039	InactiveTruss	FALSE
Spaces	1@4.833	ClipStiffness	100000	Notes	Lee - Series 1

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 1
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8Z0.060
Bracing Configuration: MidPoint

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	338	282	663	257
2.39	243	174	535	150
4.76	162	66	405	43
13.59	-207	-303	-79	-325
17.14	-387	-447	-273	-471



Input Summary:

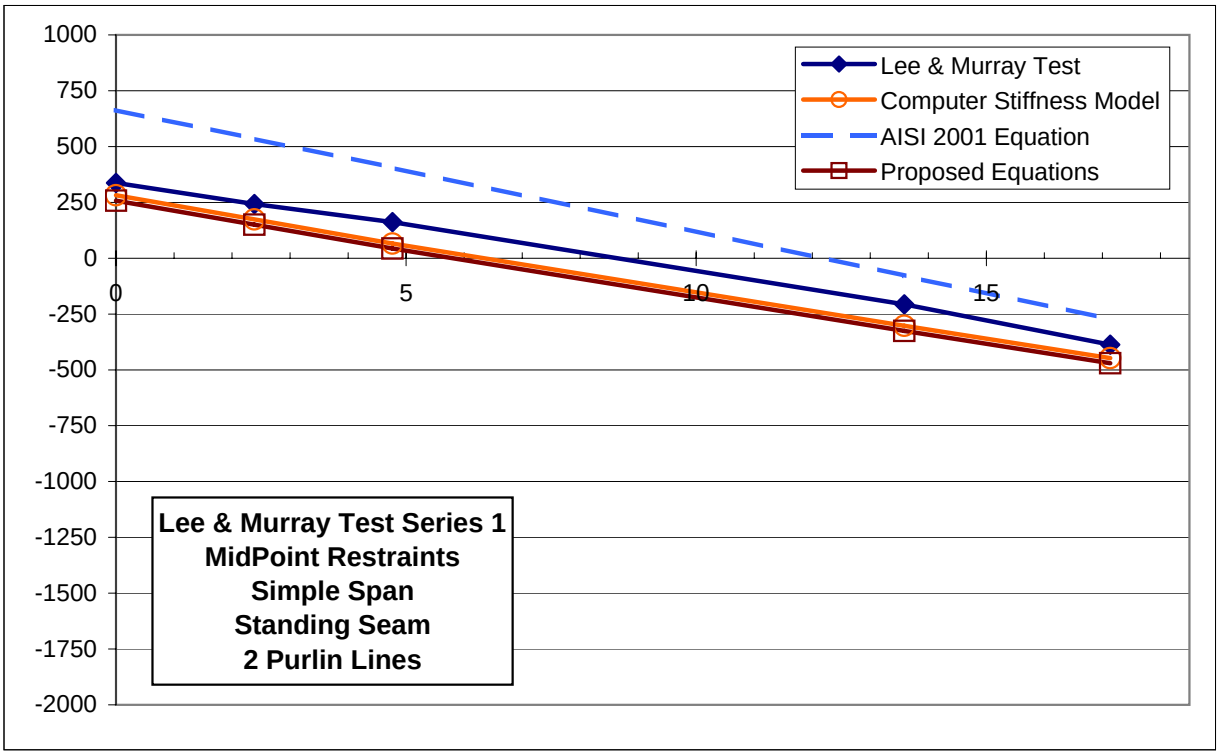
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	11	1_3Restraints	--	TribFirst	3.5
Load_	20.00 psf	1_4Restraints	--	TribLast	3.5
RestraintType1	15.252kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	15.252kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Lee1	PanelIx	0.039	InactiveTruss	FALSE
Spaces	1@4.833	ClipStiffness	100000	Notes	Lee - Series 1

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 1
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8Z0.060
Bracing Configuration: MidPoint

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	338	282	663	257
2.39	243	174	535	150
4.76	162	66	405	43
13.59	-207	-303	-79	-325
17.14	-387	-447	-273	-471



Input Summary:

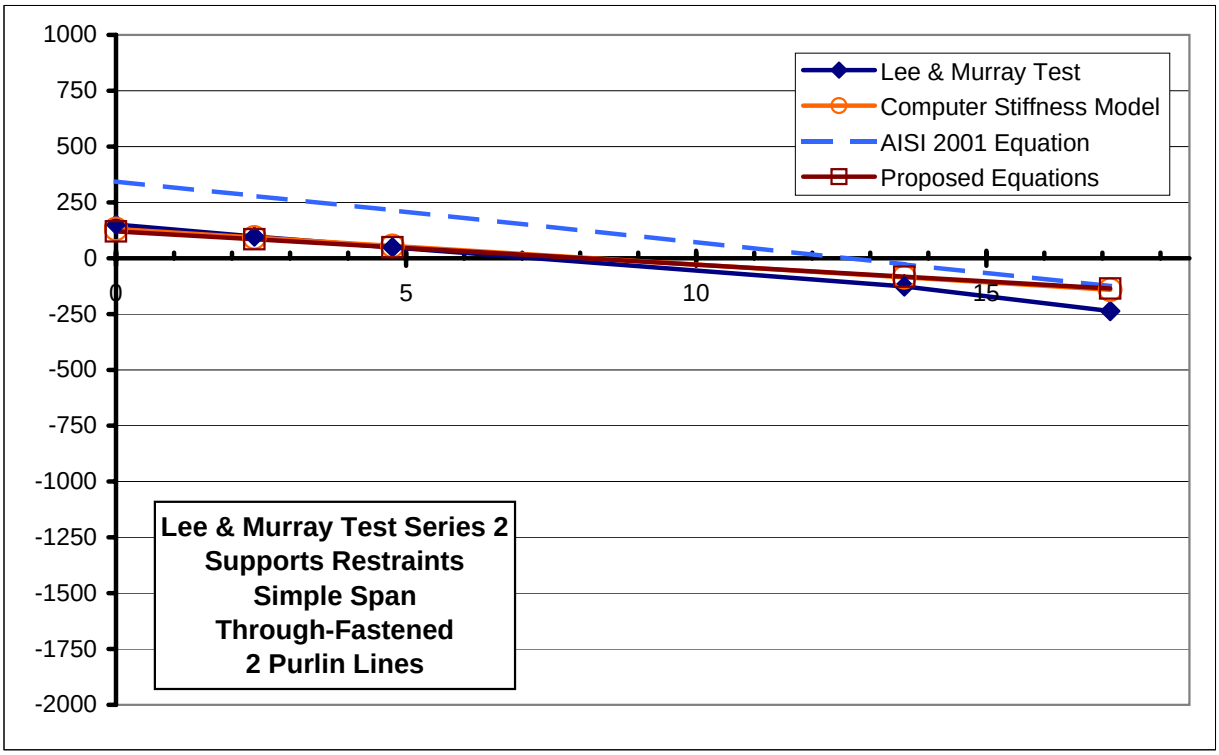
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	11	1_3Restraints	--	TribFirst	3.5
Load_	20.00 psf	1_4Restraints	--	TribLast	3.5
RestraintType1	15.252kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	15.252kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Lee1	PanelIx	0.039	InactiveTruss	FALSE
Spaces	1@4.833	ClipStiffness	100000	Notes	Lee - Series 1

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 2
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Through-Fastened

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: Supports

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	151	131	344	120
2.39	98	93	279	85
4.76	49	55	215	49
13.59	-126	-86	-28	-83
17.14	-237	-142	-125	-135



Input Summary:

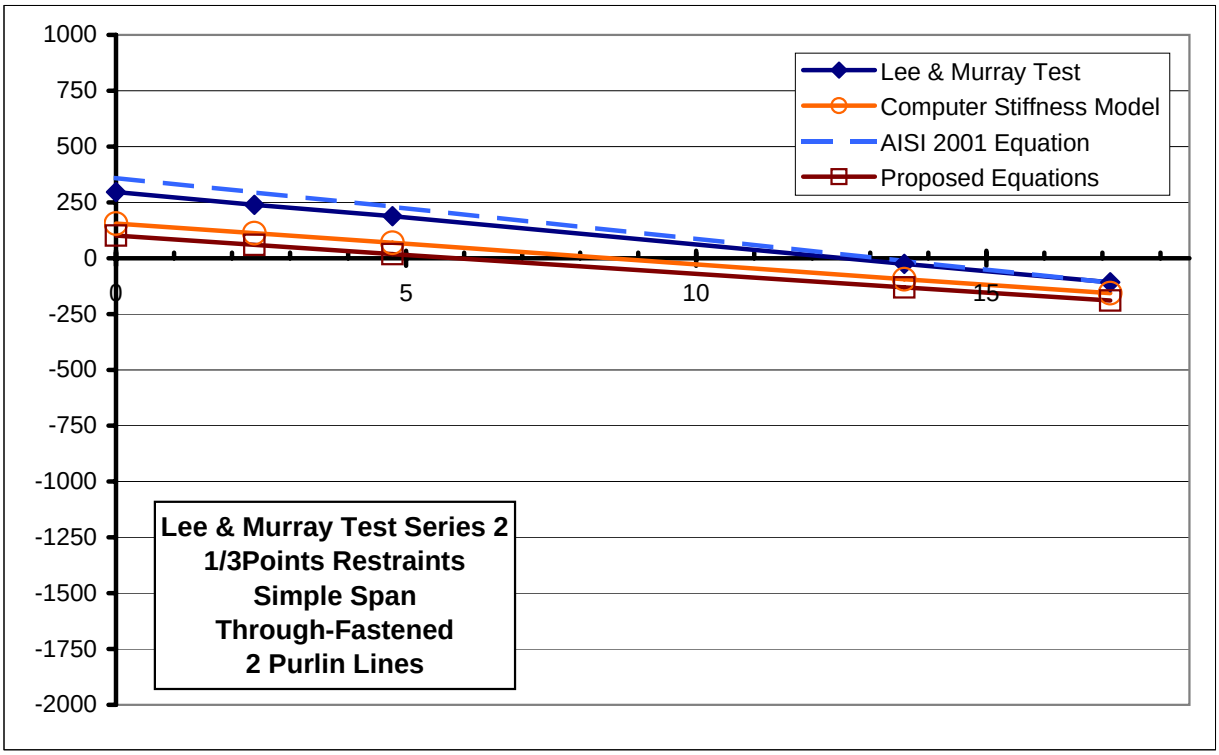
Ref Node	101103	SupRestraints	1@1-2	PanelConnStiff	1500
Index	16	1_3Restraints	--	TribFirst	3.5
Load_	20.00 psf	1_4Restraints	--	TribLast	3.5
RestraintType1	64.712kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	64.712kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Lee2	PanelIx	0.12	InactiveTruss	TRUE
Spaces	1@4.833	ClipStiffness	5000	Notes	Lee - Series 2

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 2
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Through-Fastened

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: 1/3Points

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	297	155	360	102
2.39	239	112	295	60
4.76	188	69	231	18
13.59	-25	-94	-12	-131
17.14	-108	-157	-110	-190



Input Summary:

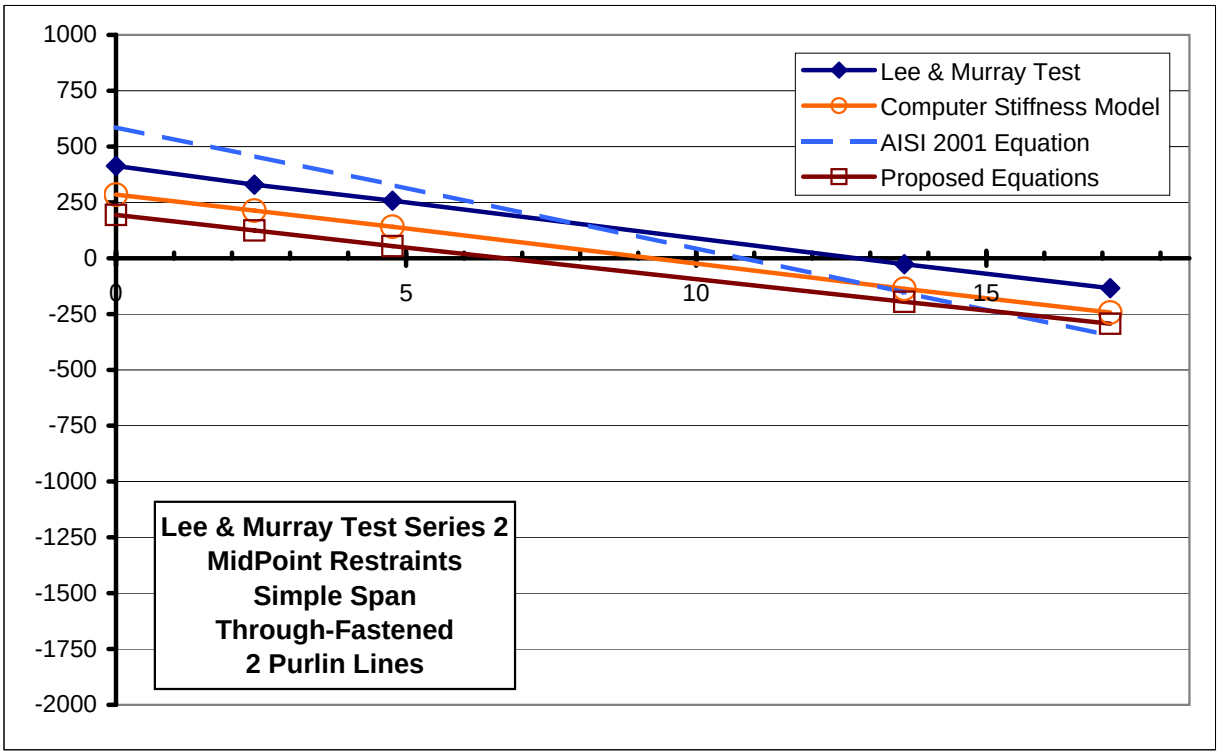
Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	21	1_3Restraints	1@1	TribFirst	3.5
Load_	20.00 psf	1_4Restraints	--	TribLast	3.5
RestraintType1	10.923kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	10.923kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Lee2	PanelIx	0.12	InactiveTruss	TRUE
Spaces	1@4.833	ClipStiffness	5000	Notes	Lee - Series 2

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 2
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Through-Fastened

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: MidPoint

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	414	285	586	194
2.39	330	213	458	124
4.76	258	141	329	54
13.59	-27	-137	-154	-195
17.14	-134	-243	-347	-294



Input Summary:

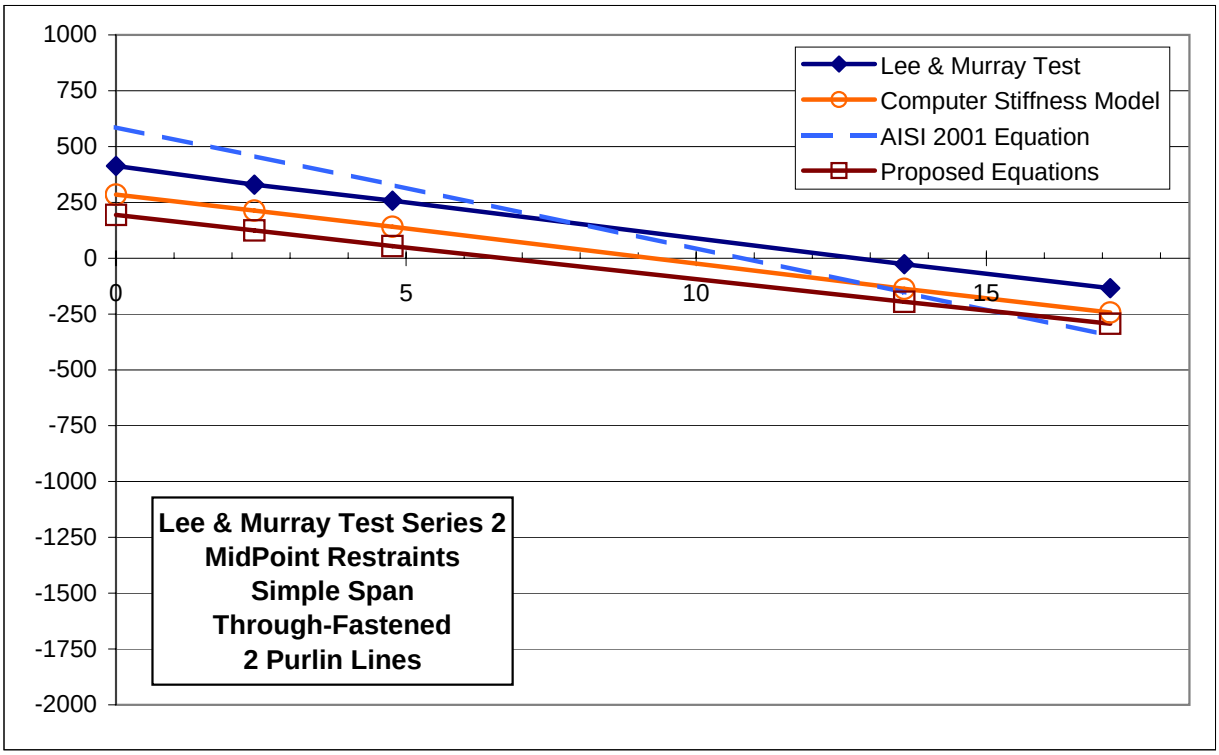
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	26	1_3Restraints	--	TribFirst	3.5
Load_	20.00 psf	1_4Restraints	--	TribLast	3.5
RestraintType1	15.252kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	15.252kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Lee2	PanelIx	0.12	InactiveTruss	TRUE
Spaces	1@4.833	ClipStiffness	5000	Notes	Lee - Series 2

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 2
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Through-Fastened

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: MidPoint

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	414	285	586	194
2.39	330	213	458	124
4.76	258	141	329	54
13.59	-27	-137	-154	-195
17.14	-134	-243	-347	-294



Input Summary:

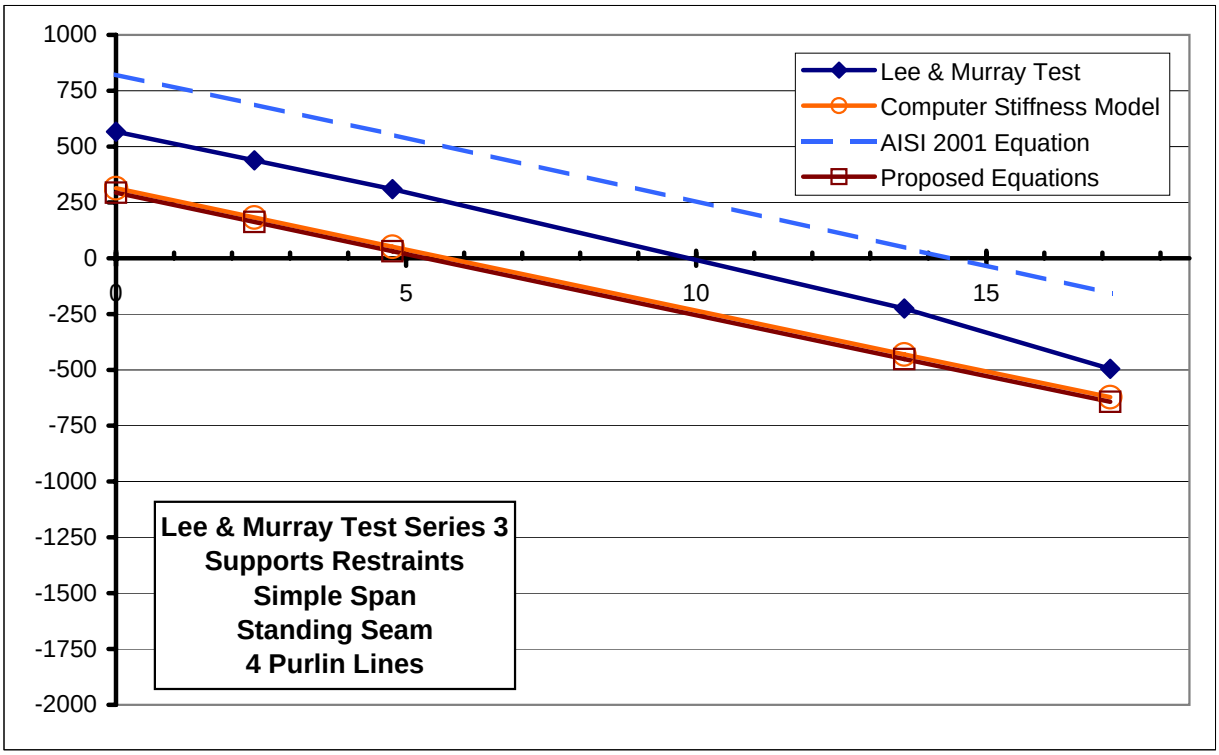
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	26	1_3Restraints	--	TribFirst	3.5
Load_	20.00 psf	1_4Restraints	--	TribLast	3.5
RestraintType1	15.252kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	15.252kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Lee2	PanelIx	0.12	InactiveTruss	TRUE
Spaces	1@4.833	ClipStiffness	5000	Notes	Lee - Series 2

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 3
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8Z0.060
Bracing Configuration: Supports

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	567	314	822	294
2.39	439	182	688	162
4.76	310	51	553	31
13.59	-225	-431	47	-451
17.14	-496	-622	-157	-643



Input Summary:

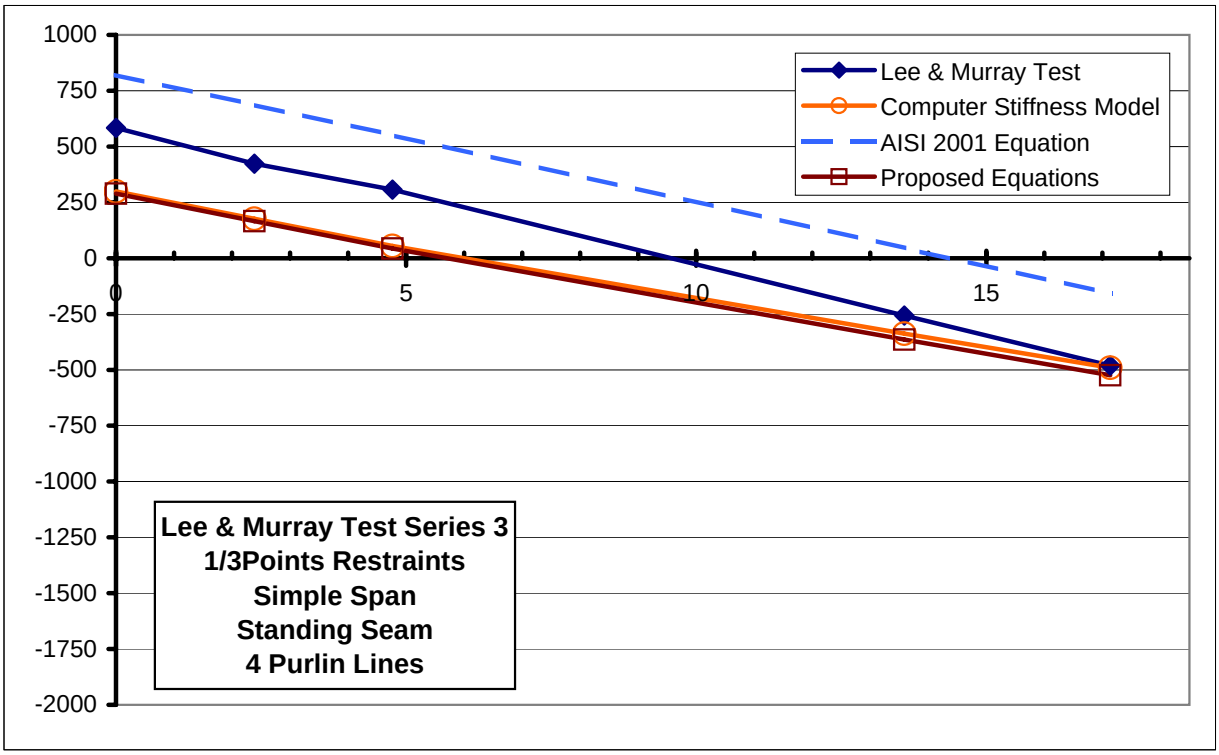
Ref Node	101103	SupRestraints	1@1-2	PanelConnStiff	1500
Index	31	1_3Restraints	--	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	183.73kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	183.73kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Lee3	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.833	ClipStiffness	100000	Notes	Lee - Series 3

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 3
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8Z0.060
Bracing Configuration: 1/3Points

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	584	299	820	289
2.39	424	177	686	166
4.76	307	55	552	43
13.59	-257	-337	46	-364
17.14	-481	-490	-159	-524



Input Summary:

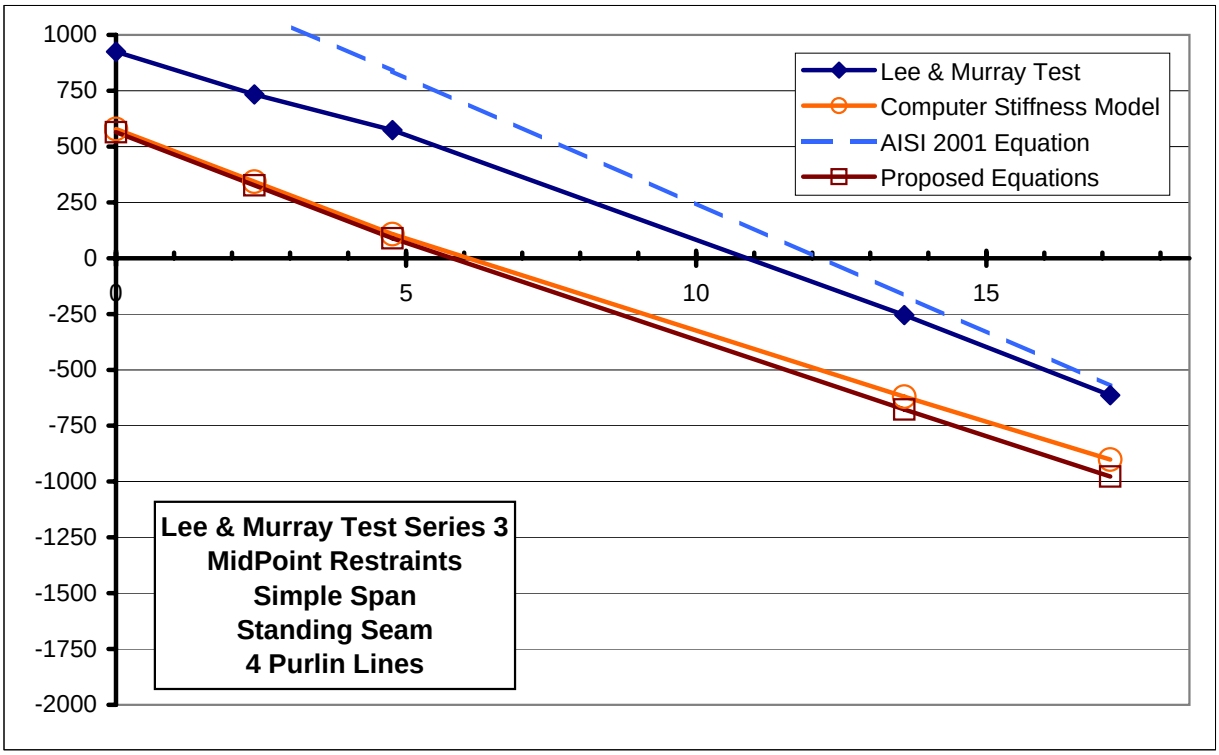
Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	36	1_3Restraints	1@1	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	12.264kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12.264kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Lee3	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.833	ClipStiffness	100000	Notes	Lee - Series 3

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 3
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8Z0.060
Bracing Configuration: MidPoint

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	925	578	1374	564
2.39	734	343	1107	326
4.76	574	108	838	89
13.59	-255	-620	-168	-678
17.14	-614	-902	-572	-978



Input Summary:

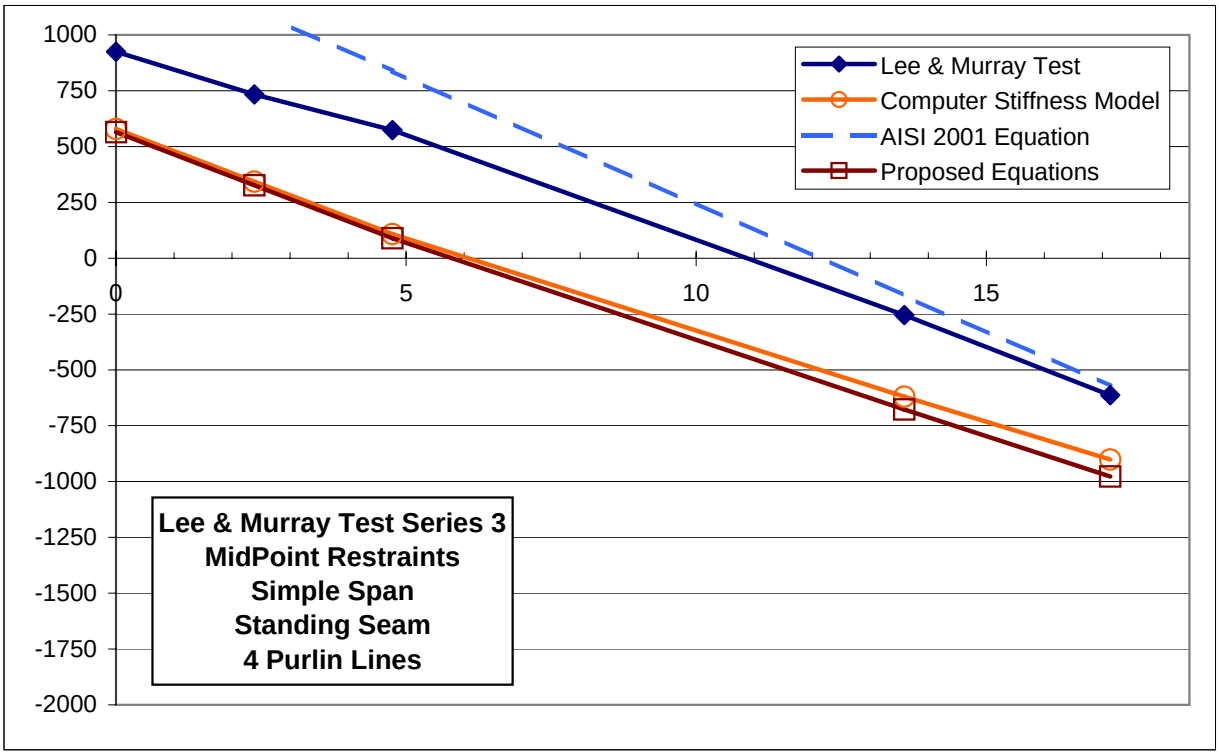
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	41	1_3Restraints	--	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	18.001kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	18.001kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Lee3	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.833	ClipStiffness	100000	Notes	Lee - Series 3

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 3
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8Z0.060
Bracing Configuration: MidPoint

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	925	578	1374	564
2.39	734	343	1107	326
4.76	574	108	838	89
13.59	-255	-620	-168	-678
17.14	-614	-902	-572	-978



Input Summary:

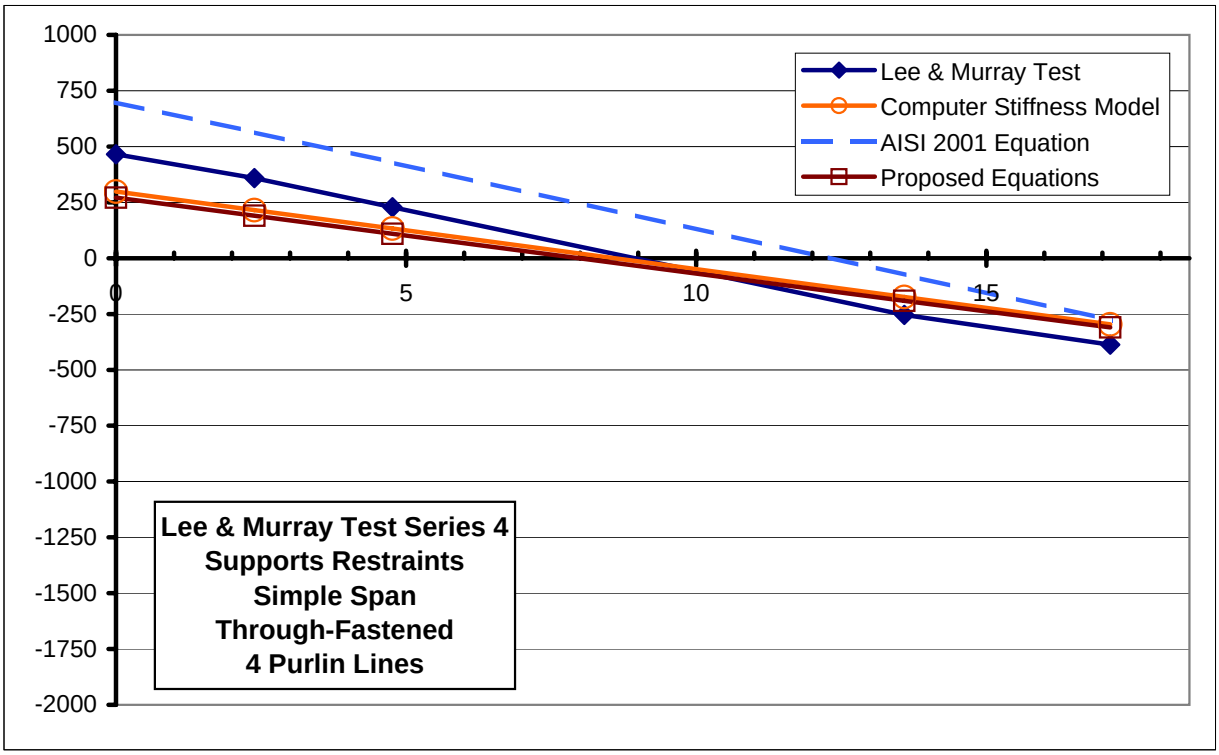
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	41	1_3Restraints	--	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	18.001kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	18.001kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Lee3	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.833	ClipStiffness	100000	Notes	Lee - Series 3

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 4
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Through-Fastened

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: Supports

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	466	298	697	271
2.39	359	216	564	190
4.76	228	133	429	109
13.59	-254	-174	-74	-190
17.14	-387	-296	-276	-310



Input Summary:

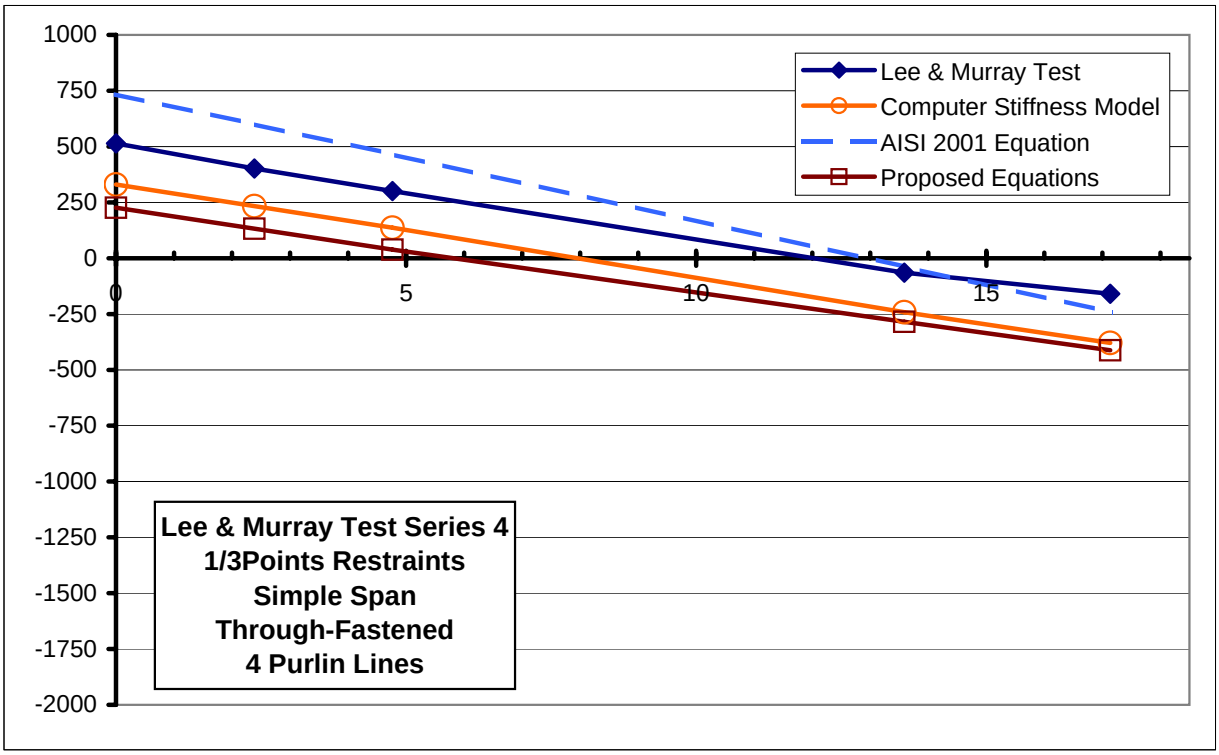
Ref Node	101103	SupRestraints	1@1-2	PanelConnStiff	1500
Index	46	1_3Restraints	--	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	183.73kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	183.73kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Lee4	PanelIx	0.12	InactiveTruss	TRUE
Spaces	3@4.833	ClipStiffness	5000	Notes	Lee - Series 4

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 4
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Through-Fastened

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: 1/3Points

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	514	330	734	226
2.39	402	233	600	132
4.76	301	136	465	39
13.59	-65	-242	-39	-285
17.14	-159	-379	-242	-412



Input Summary:

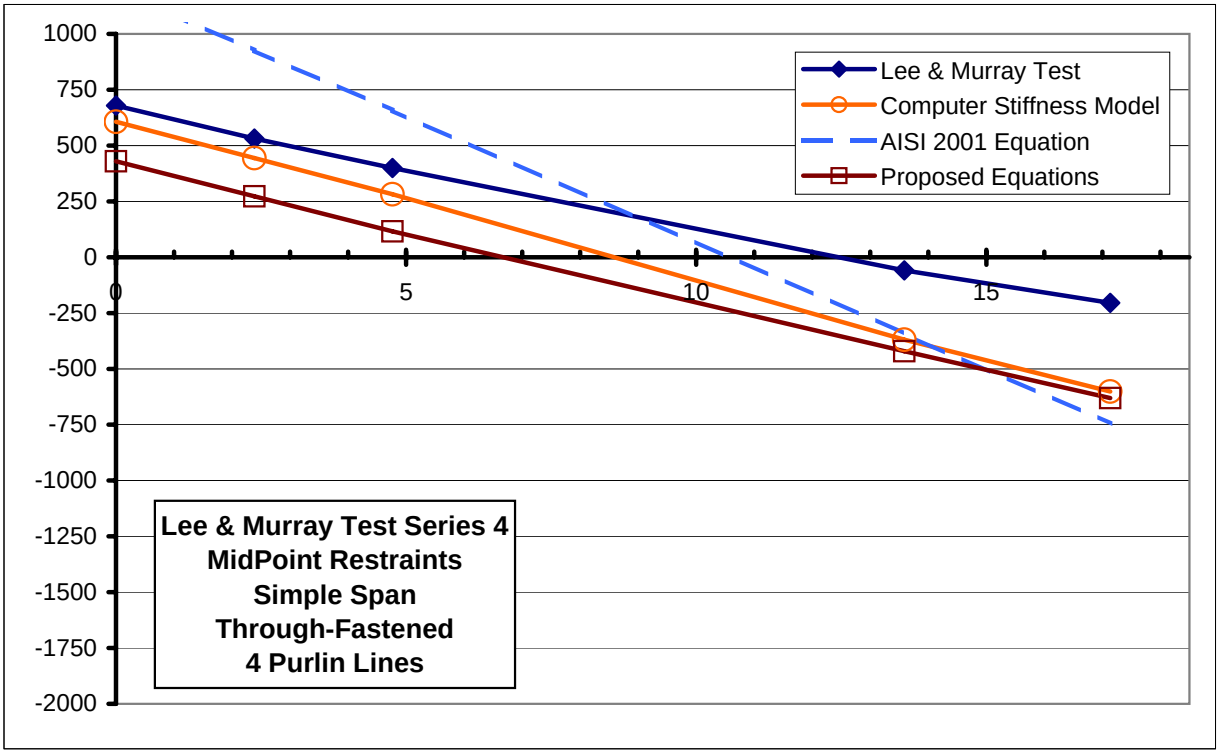
Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	51	1_3Restraints	1@1	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	12.264kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12.264kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Lee4	PanelIx	0.12	InactiveTruss	TRUE
Spaces	3@4.833	ClipStiffness	5000	Notes	Lee - Series 4

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 4
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Through-Fastened

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: MidPoint

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	679	607	1193	430
2.39	532	444	926	273
4.76	400	282	657	116
13.59	-59	-369	-344	-421
17.14	-205	-601	-746	-631



Input Summary:

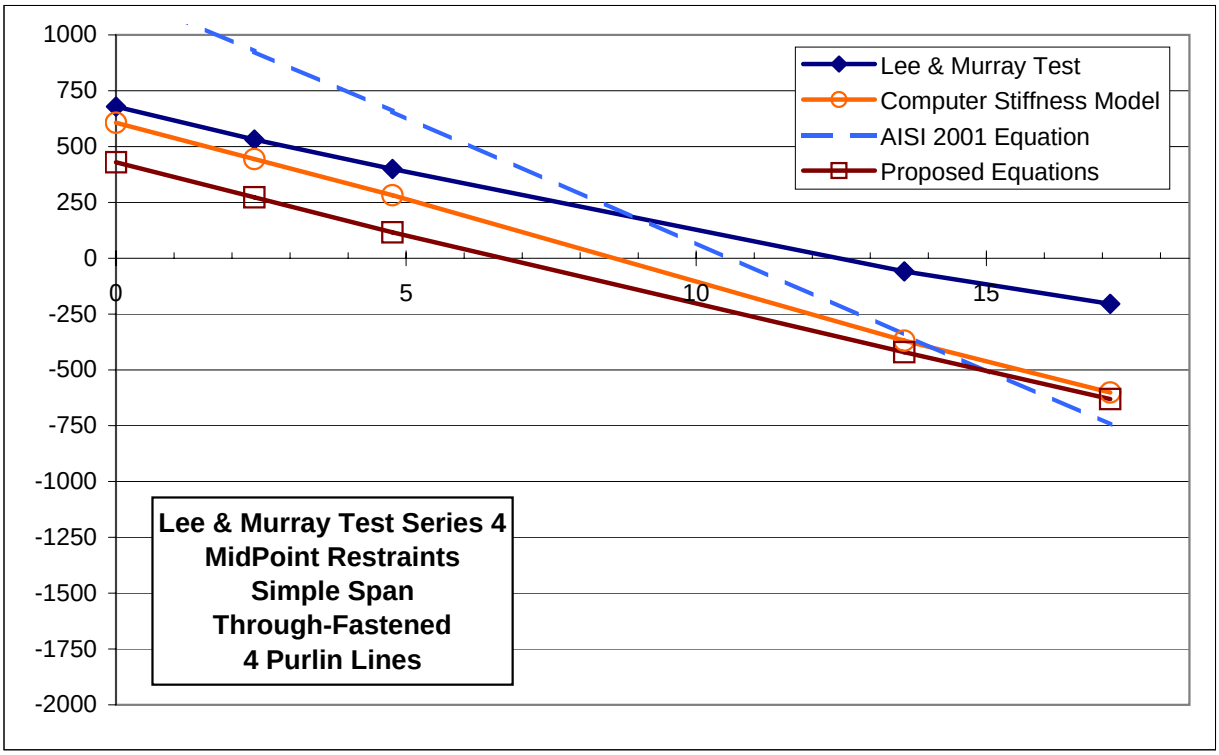
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	56	1_3Restraints	--	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	18.001kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	18.001kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Lee4	PanelIx	0.12	InactiveTruss	TRUE
Spaces	3@4.833	ClipStiffness	5000	Notes	Lee - Series 4

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 4
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Through-Fastened

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: MidPoint

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	679	607	1193	430
2.39	532	444	926	273
4.76	400	282	657	116
13.59	-59	-369	-344	-421
17.14	-205	-601	-746	-631



Input Summary:

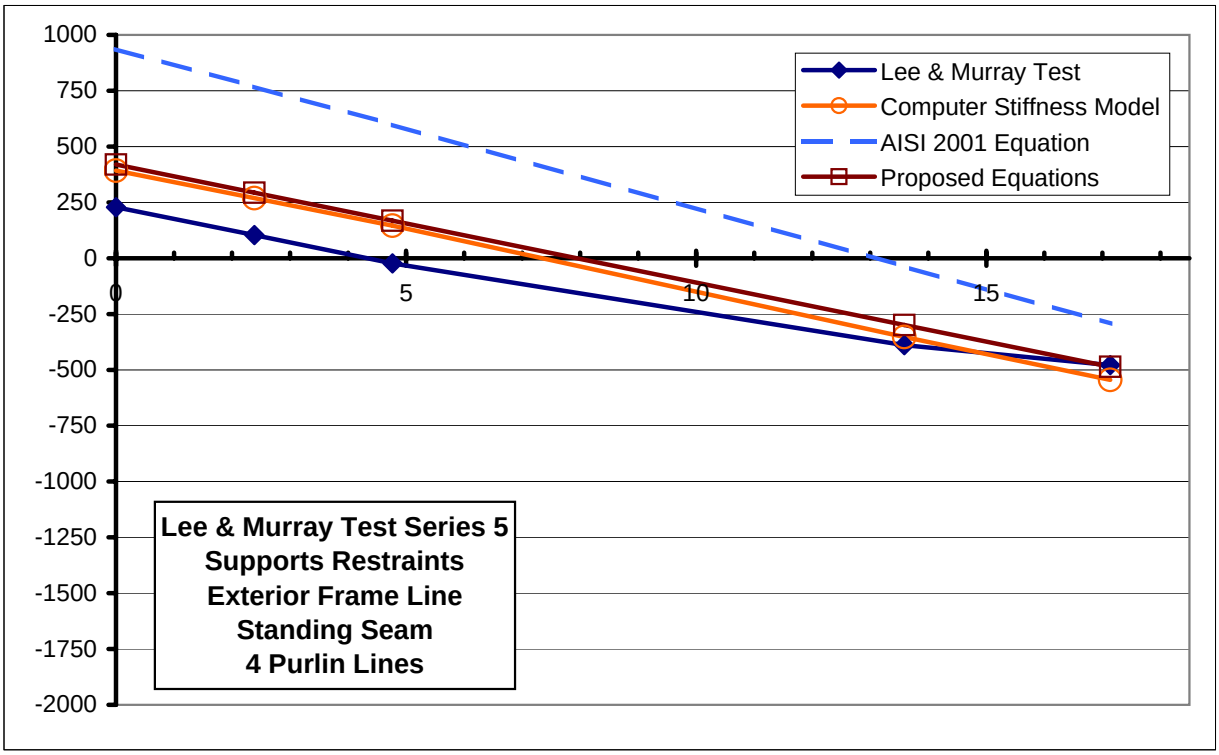
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	56	1_3Restraints	--	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	18.001kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	18.001kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Lee4	PanelIx	0.12	InactiveTruss	TRUE
Spaces	3@4.833	ClipStiffness	5000	Notes	Lee - Series 4

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 5
Span Length: 3@20ft
Number of Purlins: 4
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8Z0.060
Bracing Configuration: Supports

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	229	392	936	420
2.39	104	269	768	294
4.76	-24	146	598	168
13.59	-390	-353	-37	-299
17.14	-479	-545	-293	-486



Input Summary:

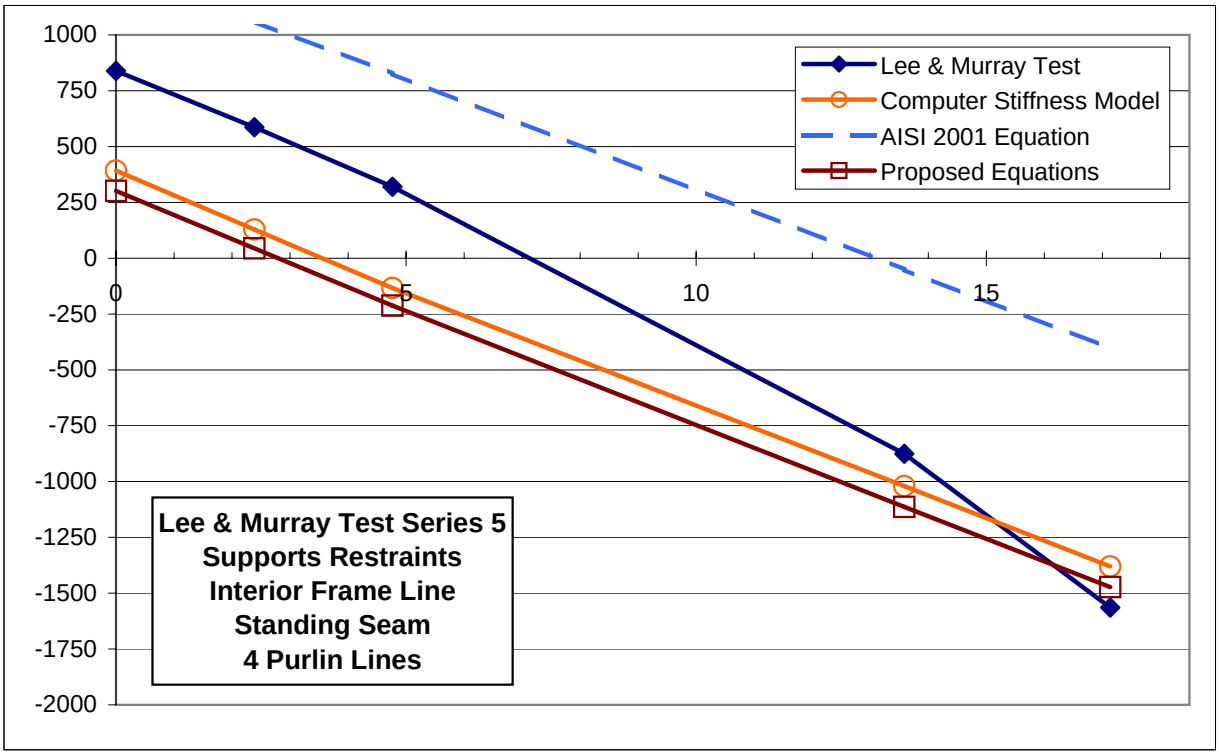
Ref Node	101103	SupRestraints	1@1-4	PanelConnStiff	1500
Index	61	1_3Restraints	--	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	183.73kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	183.73kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Lee5	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.833	ClipStiffness	100000	Notes	Lee - Series 5

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 5
Span Length: 3@20ft
Number of Purlins: 4
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8Z0.060
Bracing Configuration: Supports

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	839	392	1293	301
2.39	587	129	1060	44
4.76	320	-134	826	-213
13.59	-876	-1020	-51	-1113
17.14	-1565	-1380	-405	-1473



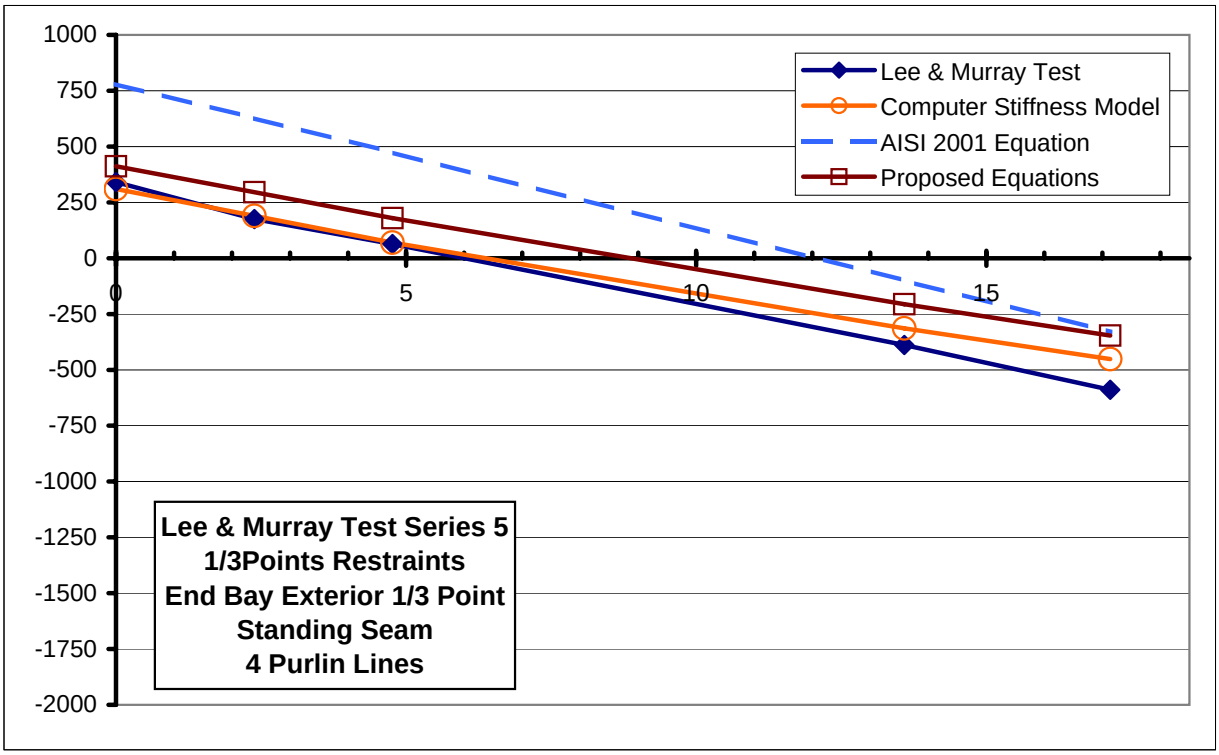
Input Summary:

Ref Node	111125	SupRestraints	1@1-4	PanelConnStiff	1500
Index	61	1_3Restraints	--	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	183.73kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	183.73kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Lee5	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.833	ClipStiffness	100000	Notes	Lee - Series 5

Purlin Restraint Model/Test Comparison

Test Series:	Lee - Series 5		
Span Length:	3@20ft	Total Weight:	10460lbs
Number of Purlins:	4	Purlin Designation:	8Z0.060
Deck Type:	Standing Seam	Bracing Configuration:	1/3Points

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	341	310	779	412
2.39	175	190	627	296
4.76	64	70	474	180
13.59	-389	-314	-100	-206
17.14	-590	-452	-330	-347



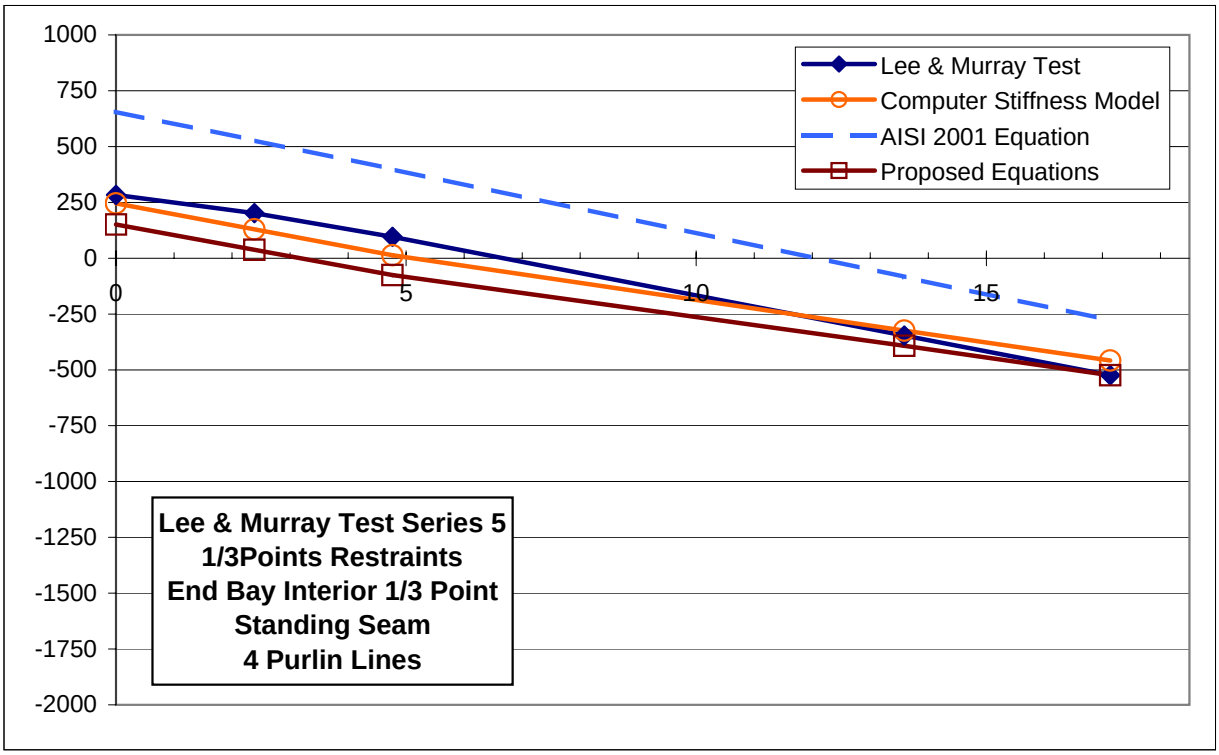
Input Summary:

Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	66	1_3Restraints	1@1-3	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	12.264kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12.264kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Lee5	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.833	ClipStiffness	100000	Notes	Lee - Series 5

Purlin Restraint Model/Test Comparison

Test Series:	Lee - Series 5		
Span Length:	3@20ft	Total Weight:	10460lbs
Number of Purlins:	4	Purlin Designation:	8Z0.060
Deck Type:	Standing Seam	Bracing Configuration:	1/3Points

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	284	246	656	151
2.39	202	130	528	38
4.76	96	14	399	-75
13.59	-347	-324	-84	-392
17.14	-524	-458	-278	-524



Input Summary:

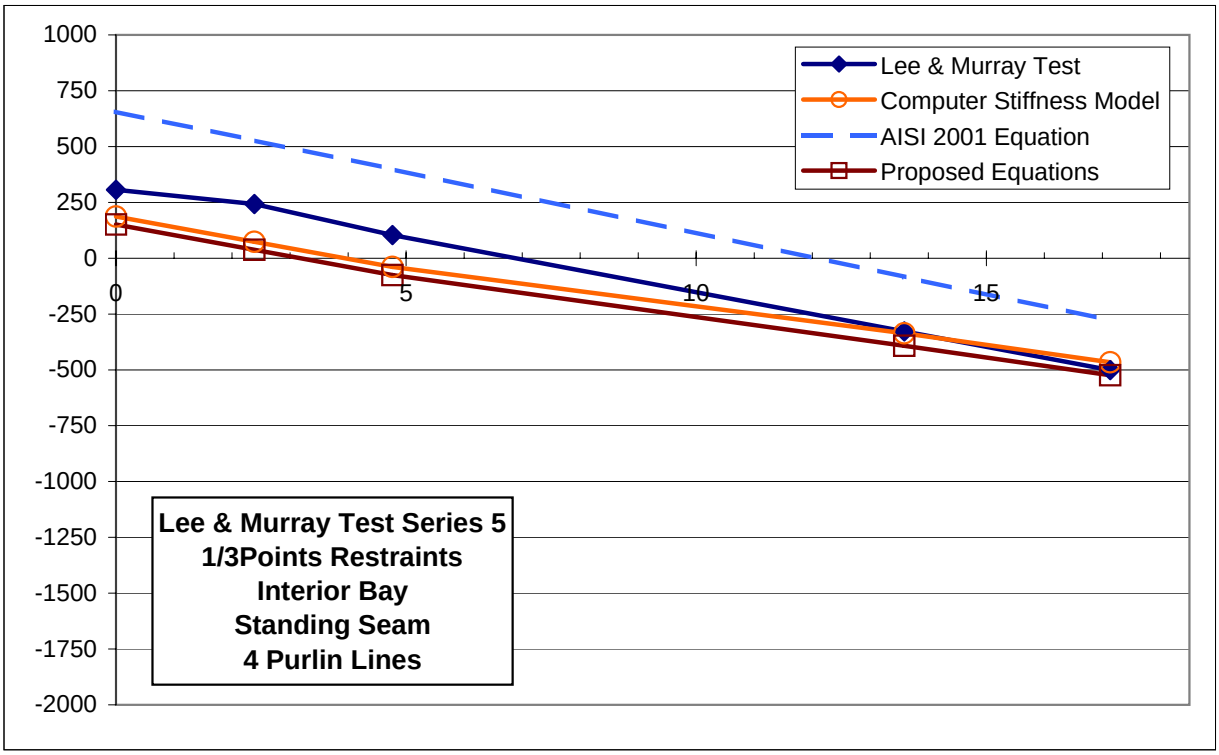
Ref Node	111116	SupRestraints	--	PanelConnStiff	1500
Index	66	1_3Restraints	1@1-3	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	12.264kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12.264kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Lee5	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.833	ClipStiffness	100000	Notes	Lee - Series 5

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 5
Span Length: 3@20ft
Number of Purlins: 4
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8Z0.060
Bracing Configuration: 1/3Points

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	307	187	656	151
2.39	243	74	528	38
4.76	104	-39	399	-75
13.59	-328	-336	-84	-392
17.14	-501	-466	-278	-524



Input Summary:

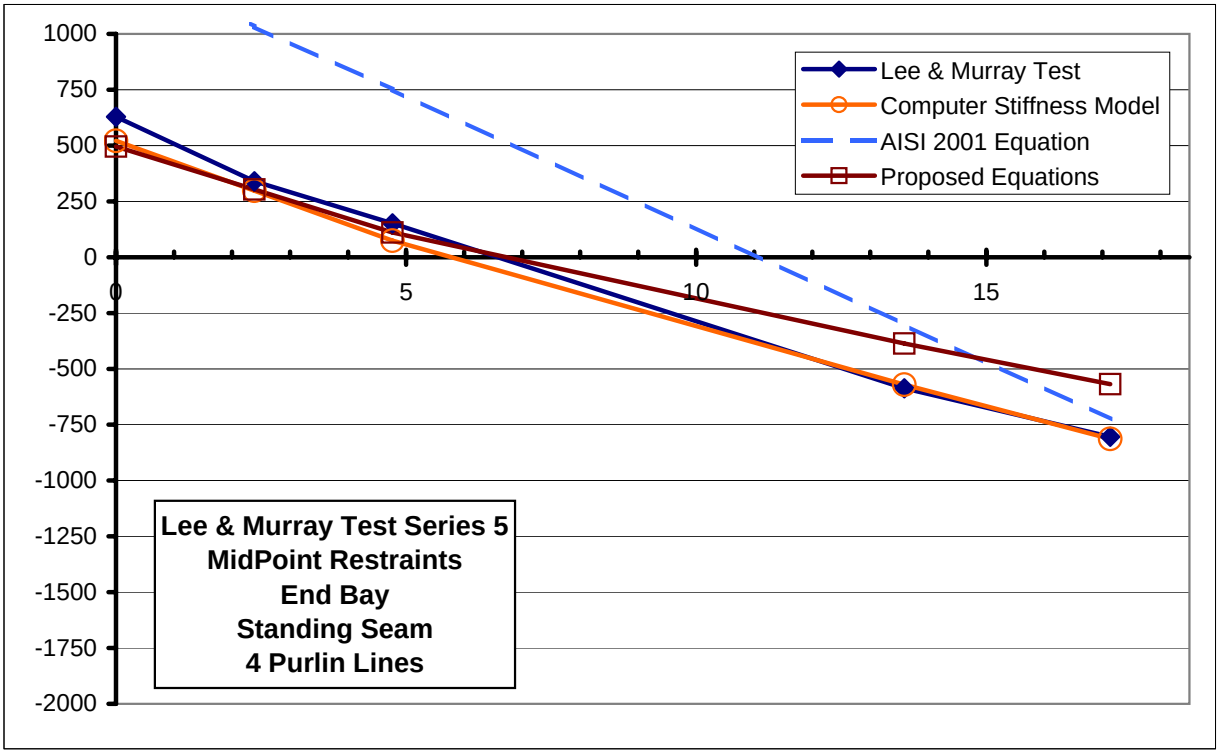
Ref Node	121108	SupRestraints	--	PanelConnStiff	1500
Index	66	1_3Restraints	1@1-3	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	12.264kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12.264kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Lee5	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.833	ClipStiffness	100000	Notes	Lee - Series 5

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 5
Span Length: 3@20ft
Number of Purlins: 4
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8Z0.060
Bracing Configuration: MidPoint

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	629	521	1313	496
2.39	340	298	1032	303
4.76	152	74	750	111
13.59	-587	-571	-302	-387
17.14	-804	-814	-725	-569



Input Summary:

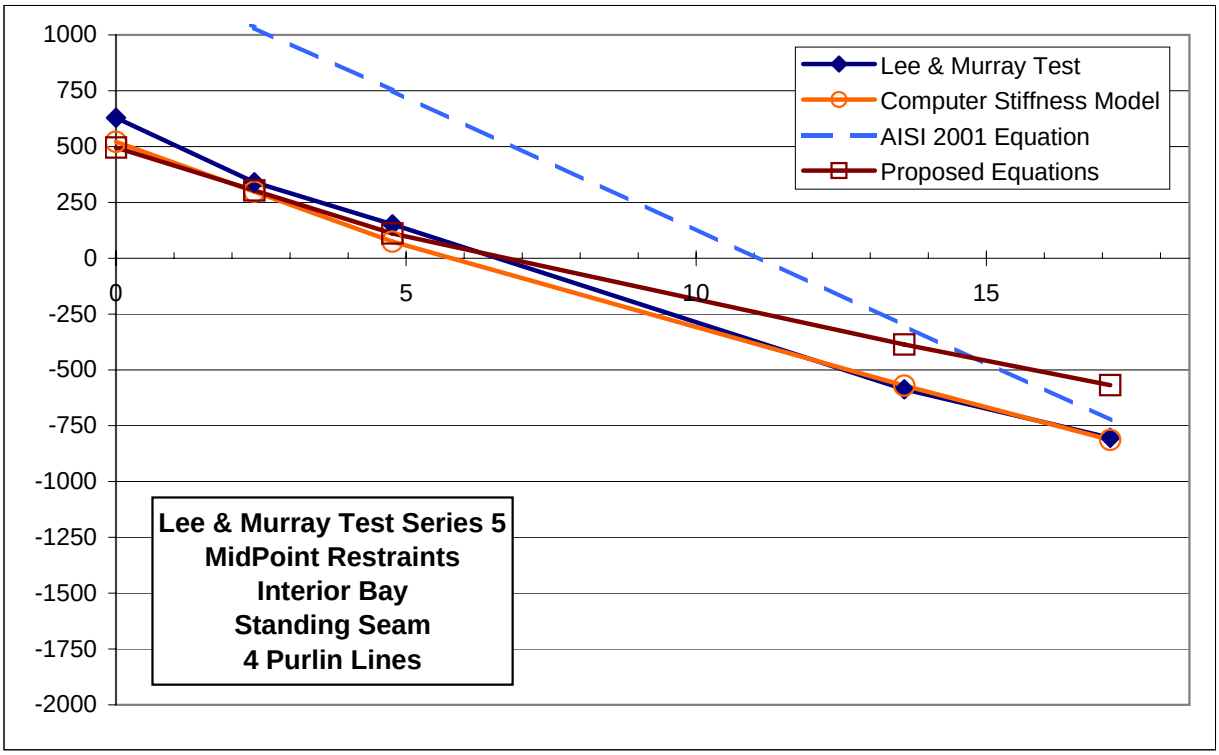
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	71	1_3Restraints	--	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	18.001kpi	MidRestraints	1@1-3	LoadOffset	4.5
RestraintType2	18.001kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Lee5	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.833	ClipStiffness	100000	Notes	Lee - Series 5

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 5
Span Length: 3@20ft
Number of Purlins: 4
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8Z0.060
Bracing Configuration: MidPoint

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	629	521	1313	496
2.39	340	298	1032	303
4.76	152	74	750	111
13.59	-587	-571	-302	-387
17.14	-804	-814	-725	-569



Input Summary:

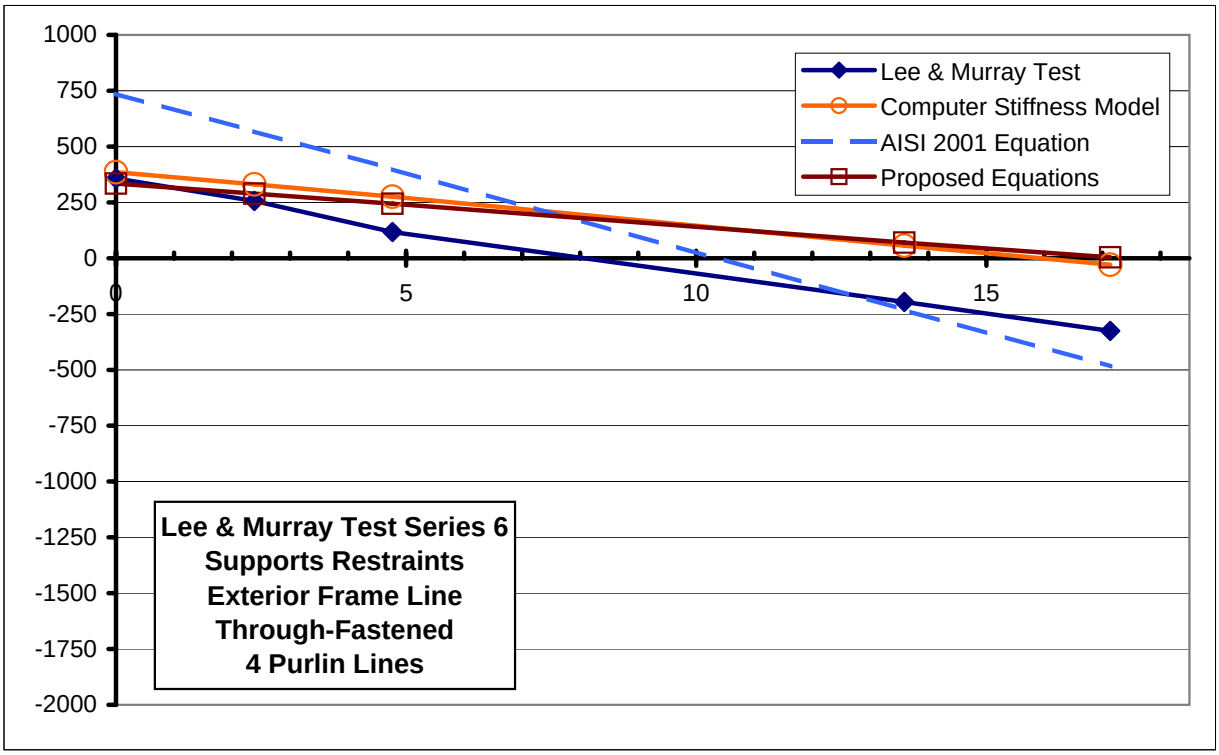
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	71	1_3Restraints	--	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	18.001kpi	MidRestraints	1@1-3	LoadOffset	4.5
RestraintType2	18.001kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Lee5	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.833	ClipStiffness	100000	Notes	Lee - Series 5

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 6
Span Length: 3@20ft
Number of Purlins: 4
Deck Type: Through-Fastened

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: Supports

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	357	385	736	334
2.39	257	331	568	289
4.76	118	276	399	244
13.59	-196	56	-231	70
17.14	-326	-29	-484	4



Input Summary:

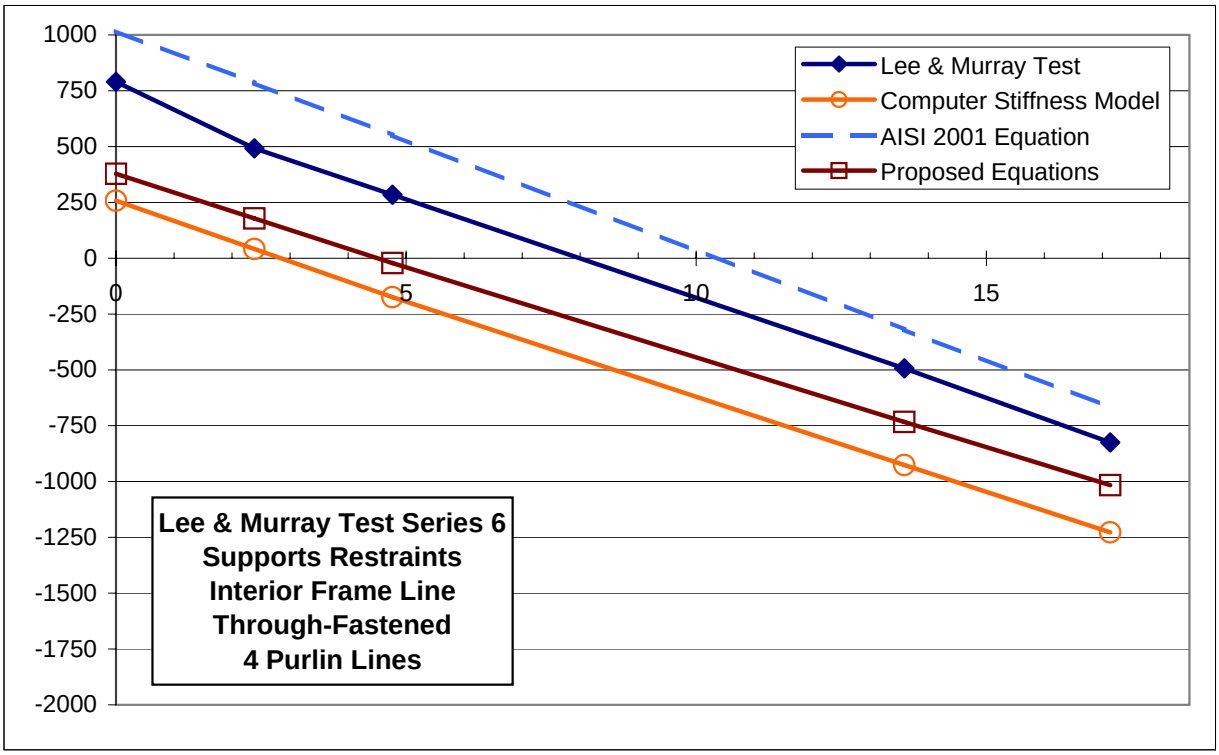
Ref Node	101103	SupRestraints	1@1-4	PanelConnStiff	1500
Index	76	1_3Restraints	--	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	183.73kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	183.73kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	3@20	PanelArea	0.288	CFactor	0.08333
Purlins	3@Lee6	PanelIx	0.12	InactiveTruss	TRUE
Spaces	3@4.833	ClipStiffness	5000	Notes	Lee - Series 6

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 6
Span Length: 3@20ft
Number of Purlins: 4
Deck Type: Through-Fastened

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: Supports

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	790	257	1017	378
2.39	492	41	784	178
4.76	284	-174	551	-21
13.59	-493	-926	-320	-734
17.14	-825	-1228	-669	-1016



Input Summary:

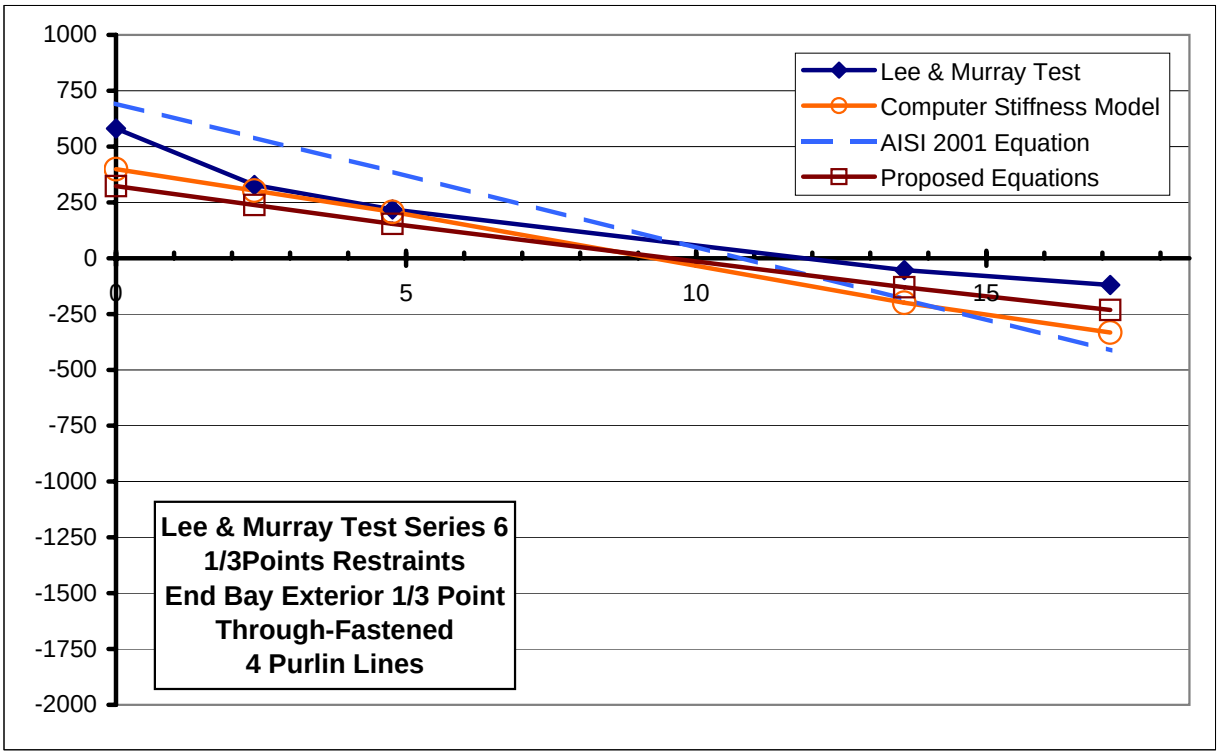
Ref Node	111125	SupRestraints	1@1-4	PanelConnStiff	1500
Index	76	1_3Restraints	--	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	183.73kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	183.73kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	3@20	PanelArea	0.288	CFactor	0.08333
Purlins	3@Lee6	PanelIx	0.12	InactiveTruss	TRUE
Spaces	3@4.833	ClipStiffness	5000	Notes	Lee - Series 6

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 6
Span Length: 3@20ft
Number of Purlins: 4
Deck Type: Through-Fastened

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: 1/3Points

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	581	399	693	323
2.39	328	303	540	238
4.76	219	207	387	154
13.59	-54	-199	-184	-130
17.14	-120	-333	-413	-232



Input Summary:

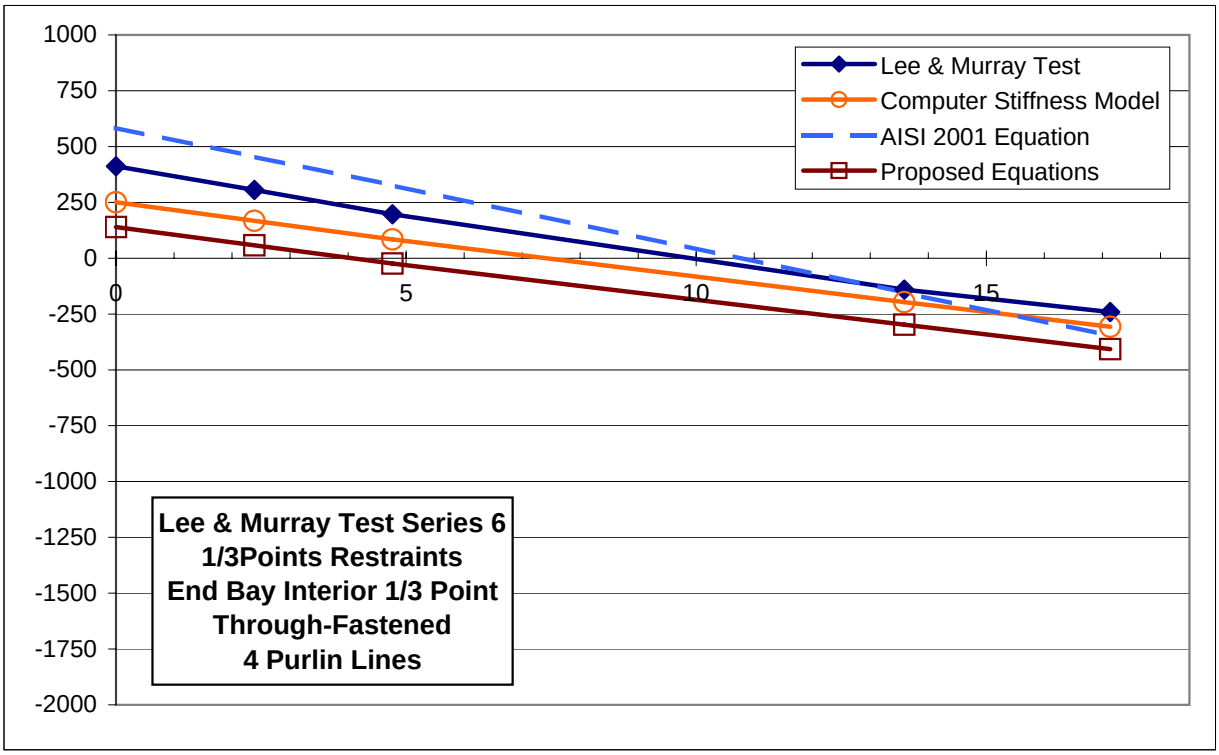
Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	81	1_3Restraints	1@1-3	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	12.264kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12.264kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	3@20	PanelArea	0.288	CFactor	0.08333
Purlins	3@Lee6	PanelIx	0.12	InactiveTruss	TRUE
Spaces	3@4.833	ClipStiffness	5000	Notes	Lee - Series 6

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 6
Span Length: 3@20ft
Number of Purlins: 4
Deck Type: Through-Fastened

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: 1/3Points

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	412	251	583	139
2.39	306	168	455	58
4.76	197	84	326	-24
13.59	-141	-196	-155	-298
17.14	-241	-307	-348	-407



Input Summary:

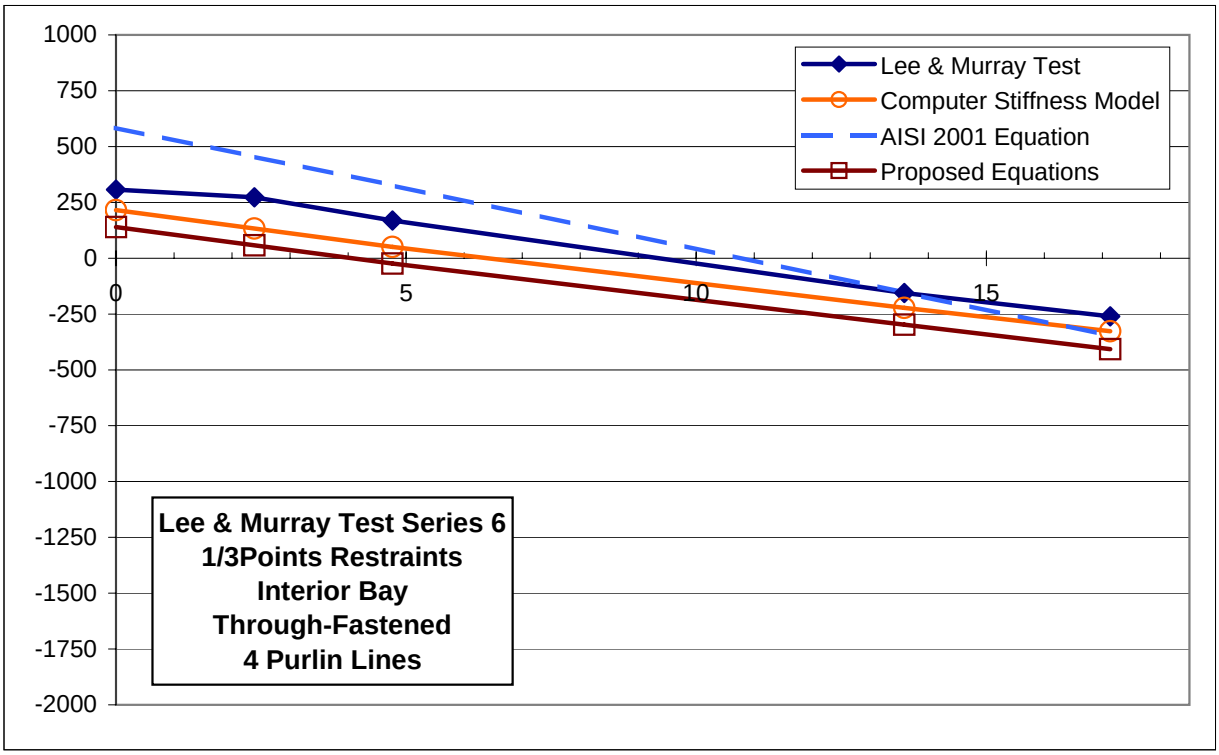
Ref Node	111116	SupRestraints	--	PanelConnStiff	1500
Index	81	1_3Restraints	1@1-3	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	12.264kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12.264kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	3@20	PanelArea	0.288	CFactor	0.08333
Purlins	3@Lee6	PanelIx	0.12	InactiveTruss	TRUE
Spaces	3@4.833	ClipStiffness	5000	Notes	Lee - Series 6

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 6
Span Length: 3@20ft
Number of Purlins: 4
Deck Type: Through-Fastened

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: 1/3Points

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	307	215	583	139
2.39	273	133	455	58
4.76	169	51	326	-24
13.59	-156	-223	-155	-298
17.14	-261	-327	-348	-407



Input Summary:

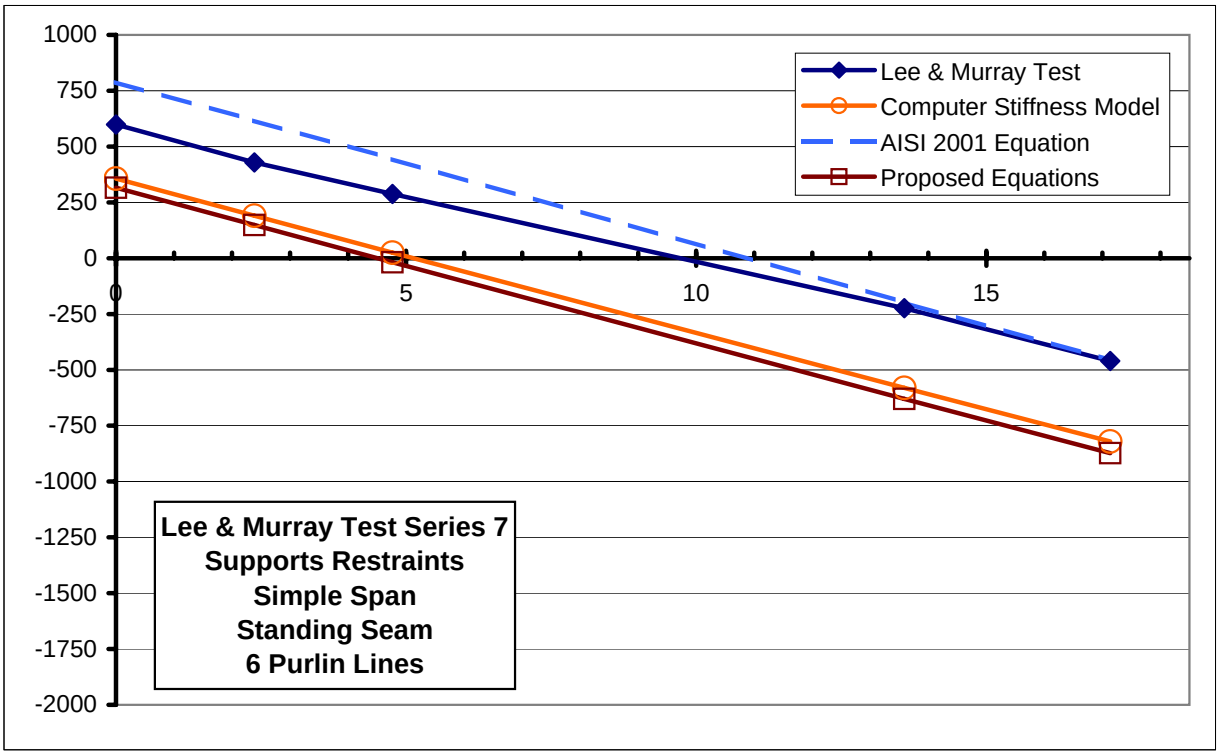
Ref Node	121108	SupRestraints	--	PanelConnStiff	1500
Index	81	1_3Restraints	1@1-3	TribFirst	3.167
Load_	20.00 psf	1_4Restraints	--	TribLast	3.167
RestraintType1	12.264kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12.264kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	3@20	PanelArea	0.288	CFactor	0.08333
Purlins	3@Lee6	PanelIx	0.12	InactiveTruss	TRUE
Spaces	3@4.833	ClipStiffness	5000	Notes	Lee - Series 6

Purlin Restraint Model/Test Comparison

Test Series: Lee - Series 7
Span Length: 1@16ft
Number of Purlins: 6
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 8.5Z0.075
Bracing Configuration: Supports

Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	599	356	788	316
2.39	429	191	616	148
4.76	288	25	444	-18
13.59	-224	-580	-199	-630
17.14	-461	-821	-457	-873



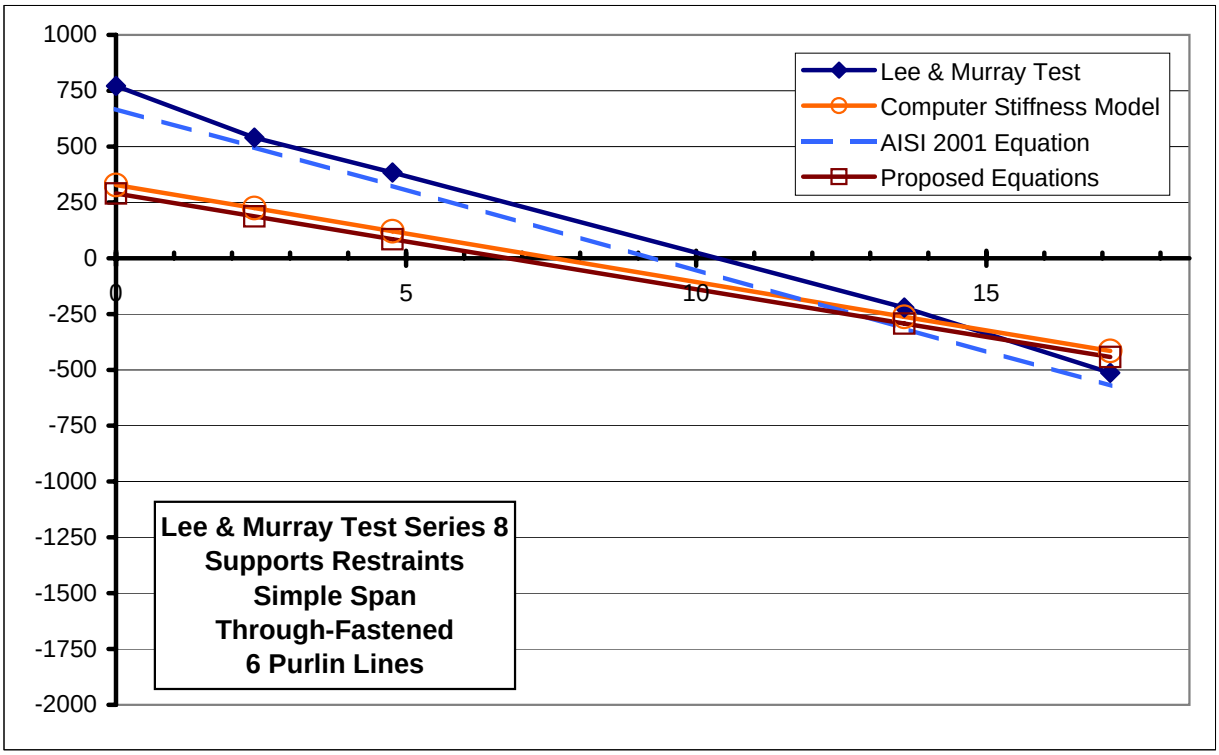
Input Summary:

Ref Node	101103	SupRestraints	1@1-2	PanelConnStiff	1500
Index	91	1_3Restraints	--	TribFirst	2.833
Load_	20.00 psf	1_4Restraints	--	TribLast	2.833
RestraintType1	123.808kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	123.808kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@16	PanelArea	0.217	CFactor	0.08333
Purlins	Lee7	PanelIx	0.039	InactiveTruss	FALSE
Spaces	5@5	ClipStiffness	100000	Notes	Lee - Series 7

Purlin Restraint Model/Test Comparison

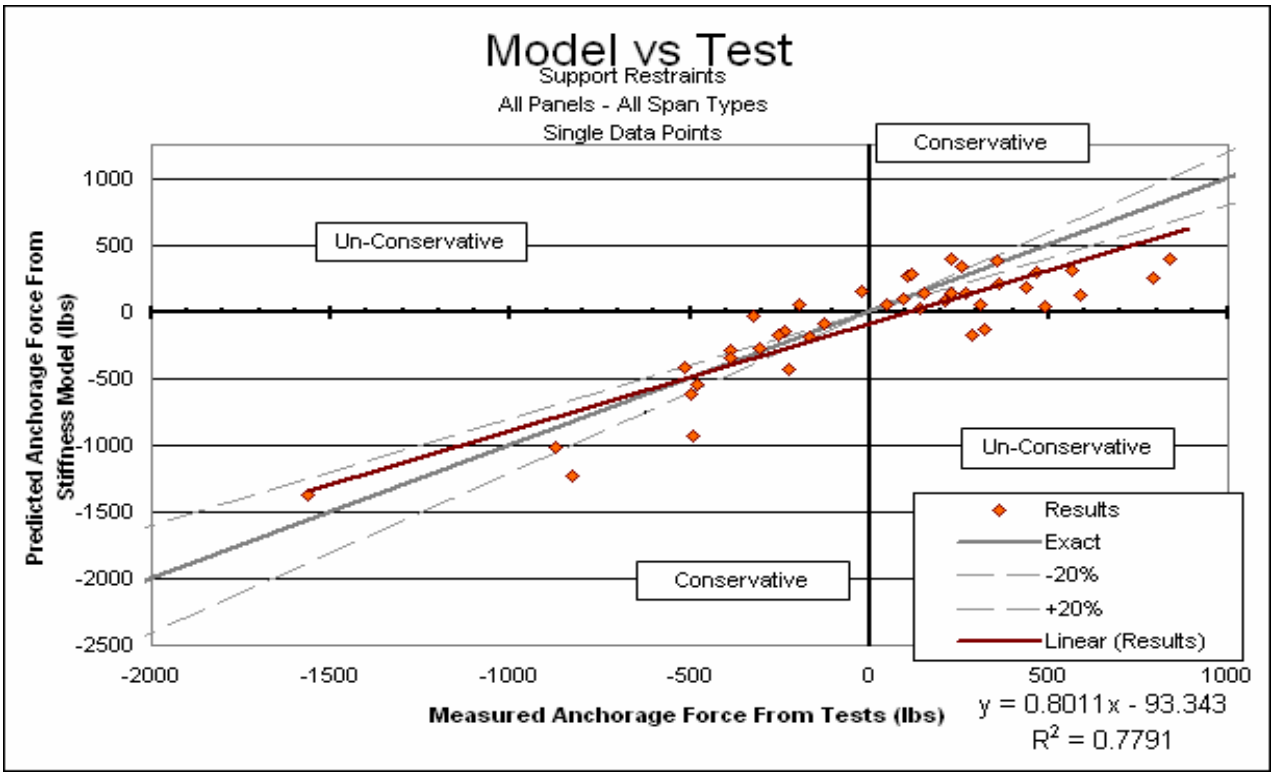
Test Series:	Lee - Series 8		
Span Length:	1@16ft	Total Weight:	10460lbs
Number of Purlins:	6	Purlin Designation:	8.5Z0.075
Deck Type:	Through-Fastened	Bracing Configuration:	Supports

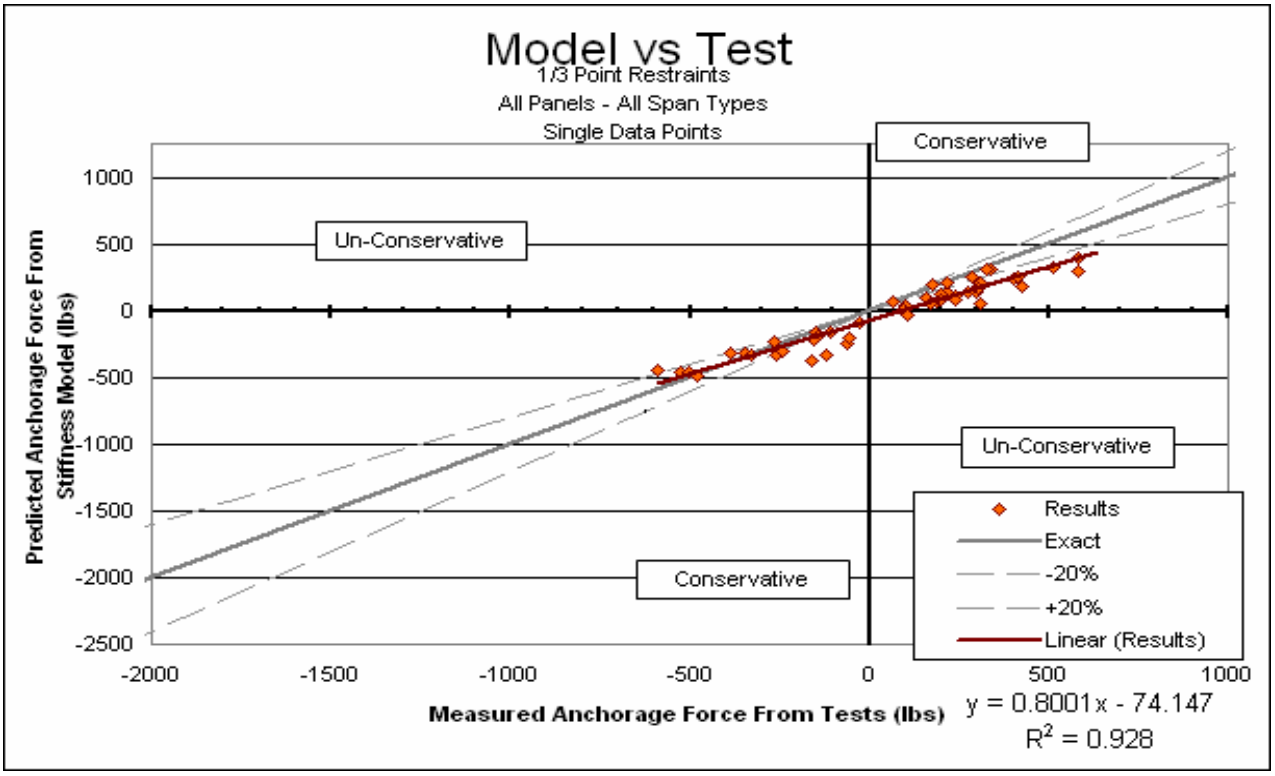
Slope (deg)	Lee & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proposed Equations
0.00	772	328	668	290
2.39	540	224	497	187
4.76	384	121	325	85
13.59	-221	-263	-315	-292
17.14	-514	-415	-571	-442

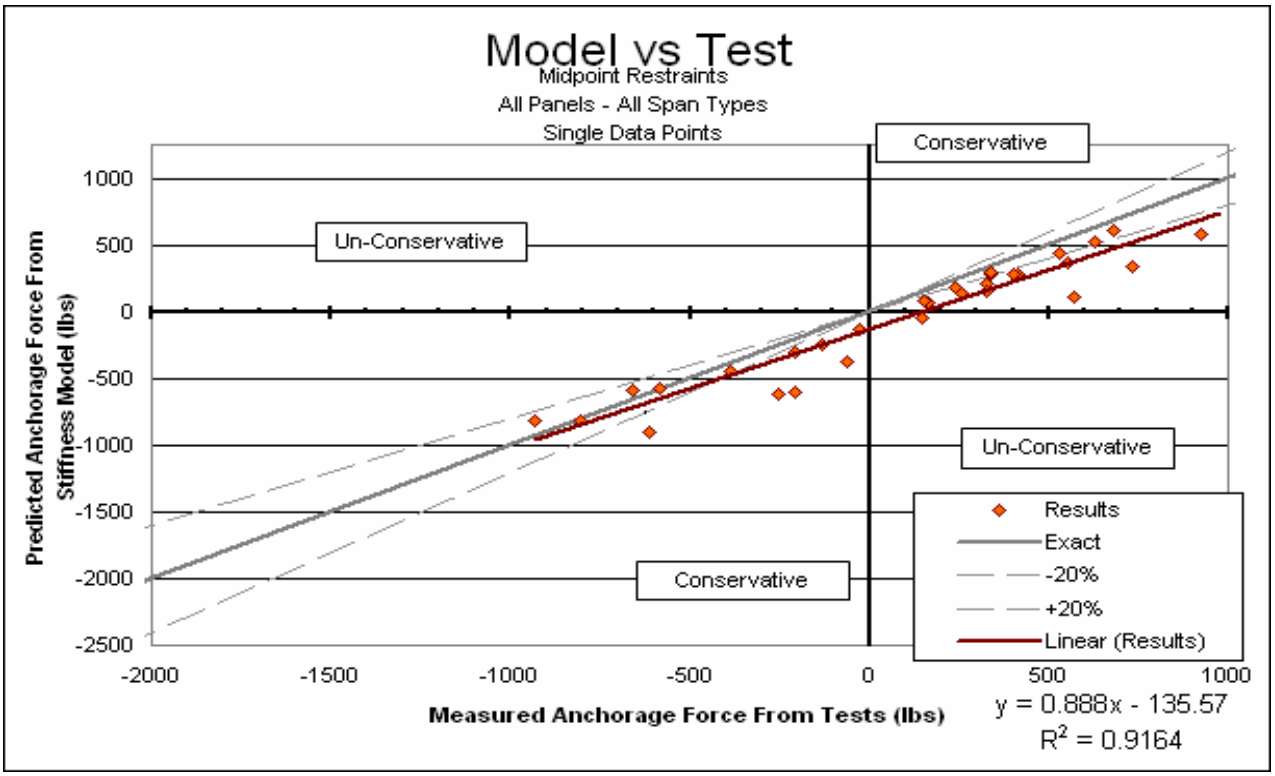


Input Summary:

Ref Node	101103	SupRestraints	1@1-2	PanelConnStiff	1500
Index	96	1_3Restraints	--	TribFirst	2.833
Load_	20.00 psf	1_4Restraints	--	TribLast	2.833
RestraintType1	123.808kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	123.808kpi	ShearStiff	1000	ModelLaps	TRUE
Bays	1@16	PanelArea	0.288	CFactor	0.08333
Purlins	Lee8	PanelIx	0.12	InactiveTruss	TRUE
Spaces	5@5	ClipStiffness	5000	Notes	Lee - Series 8


Model vs Test
Support Restraints
All Panels - All Span Types
Single Data Points
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Anchorage Force From Stiffness Model (lbs)
Measured Anchorage Force From Tests (lbs)
1000
500
0
-500
-1000
-1500
-2000
-2500
-2000
-1500
-1000
-500
0
500
1000
Results
Exact
-20%
+20%
Linear (Results)
y = 0.8011x - 93.343
R2 = 0.7791


Model vs Test
1/3 Point Restraints
All Panels - All Span Types
Single Data Points
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Anchorage Force From Stiffness Model (lbs)
Measured Anchorage Force From Tests (lbs)
1000
500
0
-500
-1000
-1500
-2000
-2500
-2000
-1500
-1000
-500
0
500
1000
Results
Exact
-20%
+20%
Linear (Results)
y = 0.8001x - 74.147
R2 = 0.928


Model vs Test
Midpoint Restraints
All Panels - All Span Types
Single Data Points
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Anchorage Force From Stiffness Model (lbs)
Measured Anchorage Force From Tests (lbs)
1000
500
0
-500
-1000
-1500
-2000
-2500
-2000
-1500
-1000
-500
0
500
1000
Results
Exact
-20%
+20%
Linear (Results)
y = 0.888x - 135.57
R2 = 0.9164

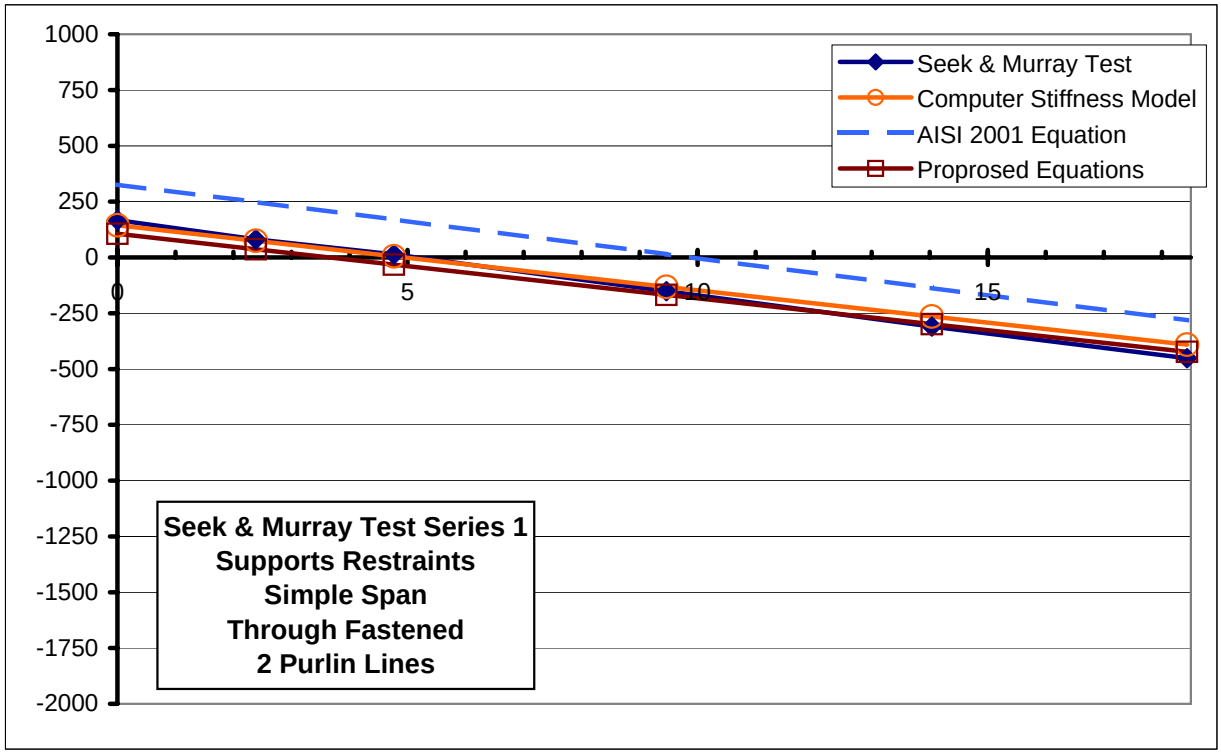
APPENDIX B:
COMPARISON OF PREDICTIONS TO SEEK AND MURRAY TESTING

Purlin Restraint Model/Test Comparison

Test Series: 1
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Through Fastened

Total Weight: 3400lbs
Purlin Designation: 10Z0.097
Bracing Configuration: Supports

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	167	144	326	106
2.39	81	75	248	37
4.76	14	5	170	-32
9.46	-152	-132	15	-168
14.04	-310	-265	-137	-299
18.43	-452	-391	-282	-423



Input Summary:

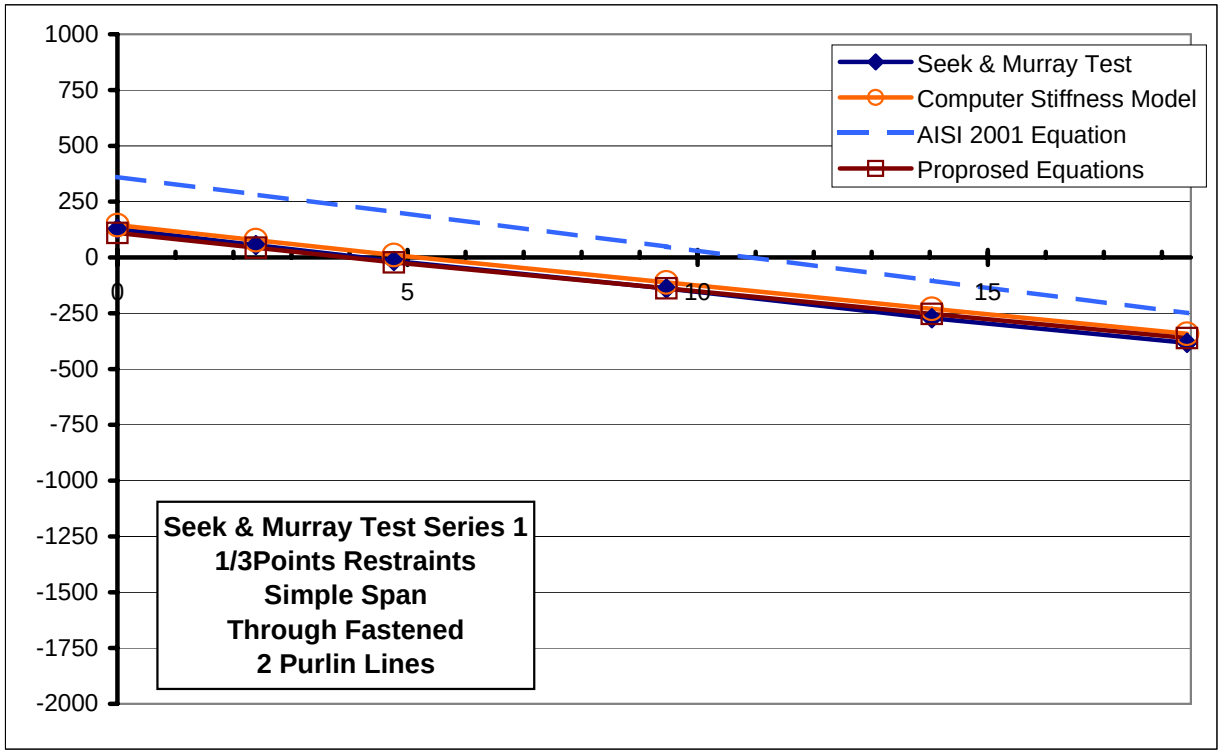
Ref Node	101103	SupRestraints	1@1-2	PanelConnStiff	1500
Index	1	1_3Restraints	--	TribFirst	4
Load_	21.25 psf	1_4Restraints	--	TribLast	4
RestraintType1	38kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	38kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Seek1/4	PanelIx	0.039	InactiveTruss	FALSE
Spaces	1@4.5	ClipStiffness	100000	Notes	Seek - Series 1

Purlin Restraint Model/Test Comparison

Test Series: 1
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Through Fastened

Total Weight: 3400lbs
Purlin Designation: 10Z0.097
Bracing Configuration: 1/3Points

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	128	144	360	109
2.39	55	78	282	44
4.76	-16	11	204	-22
9.46	-139	-112	48	-139
14.04	-273	-230	-104	-253
18.43	-383	-342	-250	-362



Input Summary:

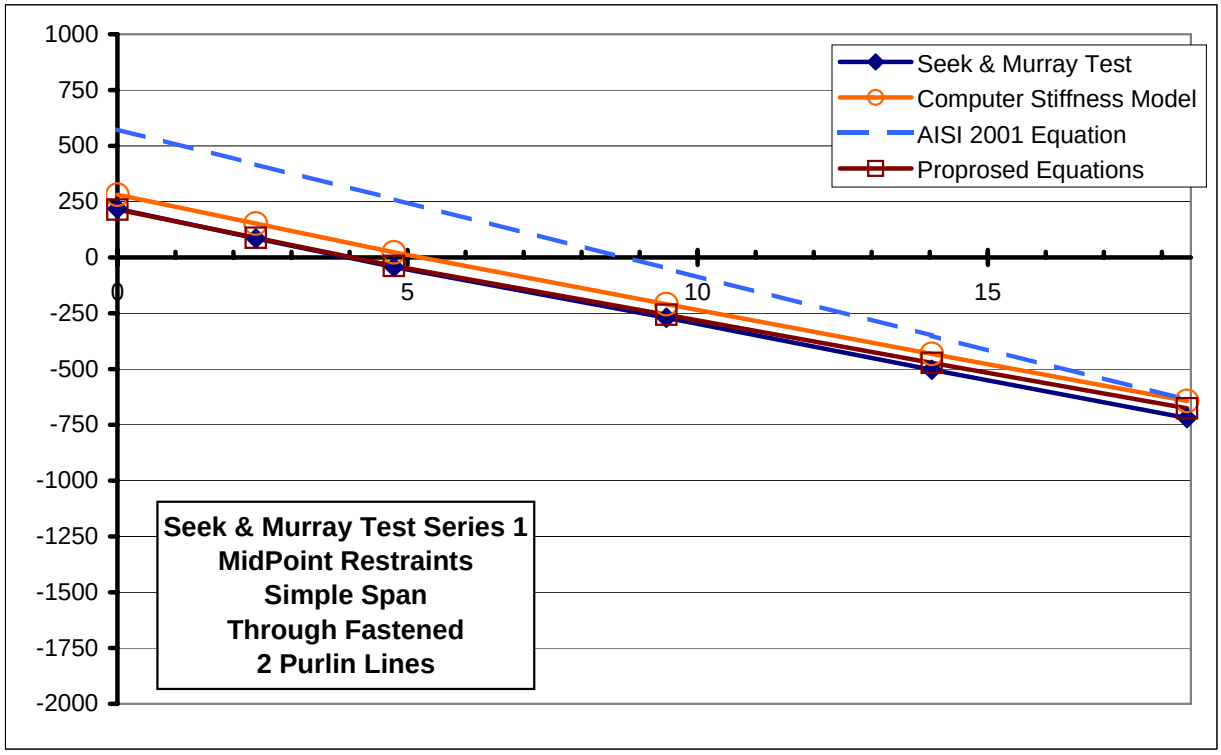
Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	49	1_3Restraints	1@1	TribFirst	4
Load_	21.25 psf	1_4Restraints	--	TribLast	4
RestraintType1	9.8kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	9.8kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Seek1/4	PanelIx	0.039	InactiveTruss	FALSE
Spaces	1@4.5	ClipStiffness	100000	Notes	Seek - Series 1

Purlin Restraint Model/Test Comparison

Test Series: 1
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Through Fastened

Total Weight: 3400lbs
Purlin Designation: 10Z0.097
Bracing Configuration: MidPoint

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	218	281	573	214
2.39	85	152	417	88
4.76	-43	23	261	-38
9.46	-270	-209	-49	-257
14.04	-503	-432	-351	-472
18.43	-720	-643	-639	-676



Input Summary:

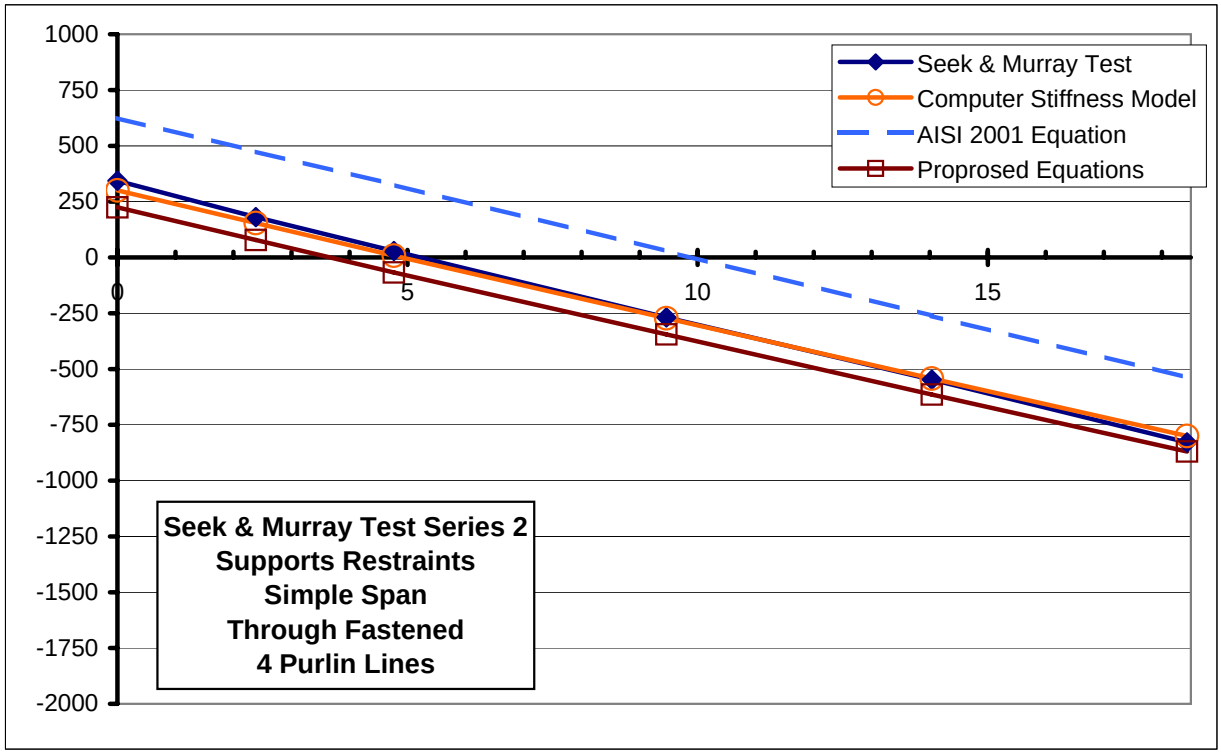
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	145	1_3Restraints	--	TribFirst	4
Load_	21.25 psf	1_4Restraints	--	TribLast	4
RestraintType1	13kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	13kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Seek1/4	PanelIx	0.039	InactiveTruss	FALSE
Spaces	1@4.5	ClipStiffness	100000	Notes	Seek - Series 1

Purlin Restraint Model/Test Comparison

Test Series: 2
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Through Fastened

Total Weight: 7150lbs
Purlin Designation: 10Z0.097
Bracing Configuration: Supports

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	344	300	624	224
2.39	181	154	475	78
4.76	29	8	325	-67
9.46	-269	-272	28	-345
14.04	-548	-543	-262	-614
18.43	-829	-800	-538	-870



Input Summary:

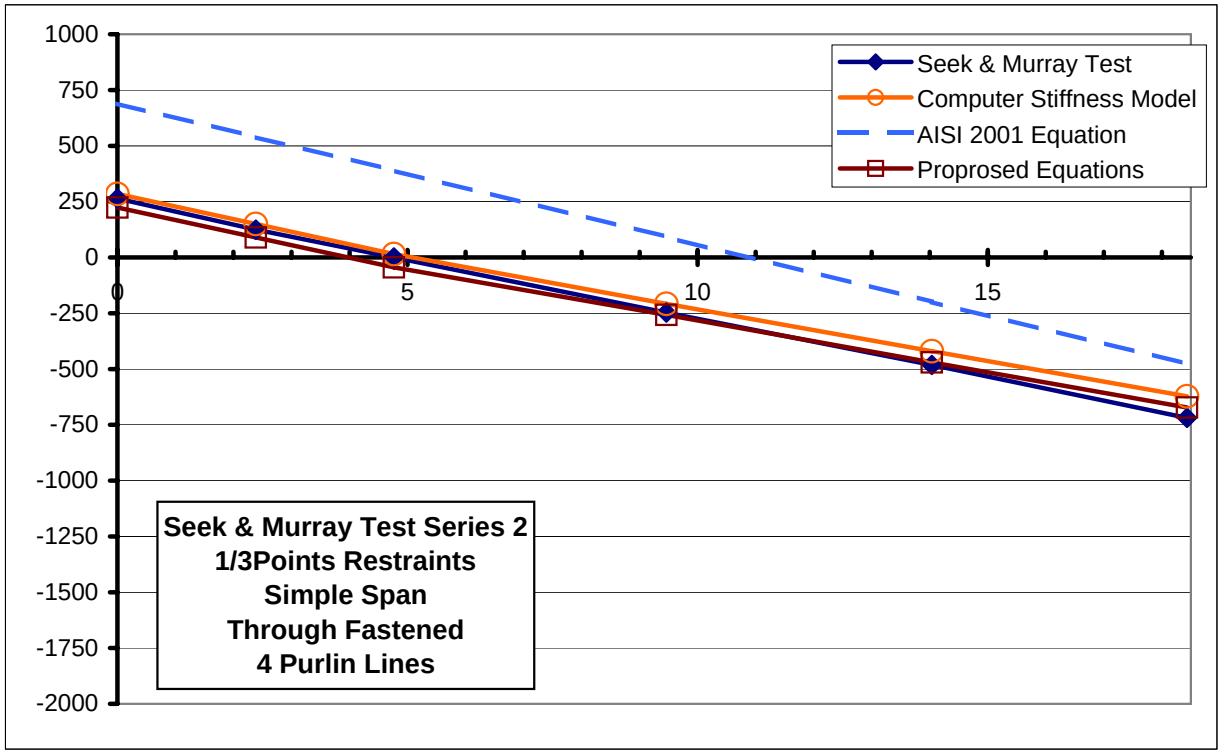
Ref Node	101103	SupRestraints	1@1-2	PanelConnStiff	1500
Index	7	1_3Restraints	--	TribFirst	3.75
Load_	21.67 psf	1_4Restraints	--	TribLast	3.75
RestraintType1	142kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	142kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Seek2/5	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.5	ClipStiffness	100000	Notes	Seek - Series 2

Purlin Restraint Model/Test Comparison

Test Series: 2
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Through Fastened

Total Weight: 7150lbs
Purlin Designation: 10Z0.097
Bracing Configuration: 1/3Points

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	264	284	689	224
2.39	125	150	539	90
4.76	0	15	389	-44
9.46	-248	-208	92	-257
14.04	-482	-420	-199	-470
18.43	-719	-622	-477	-672



Input Summary:

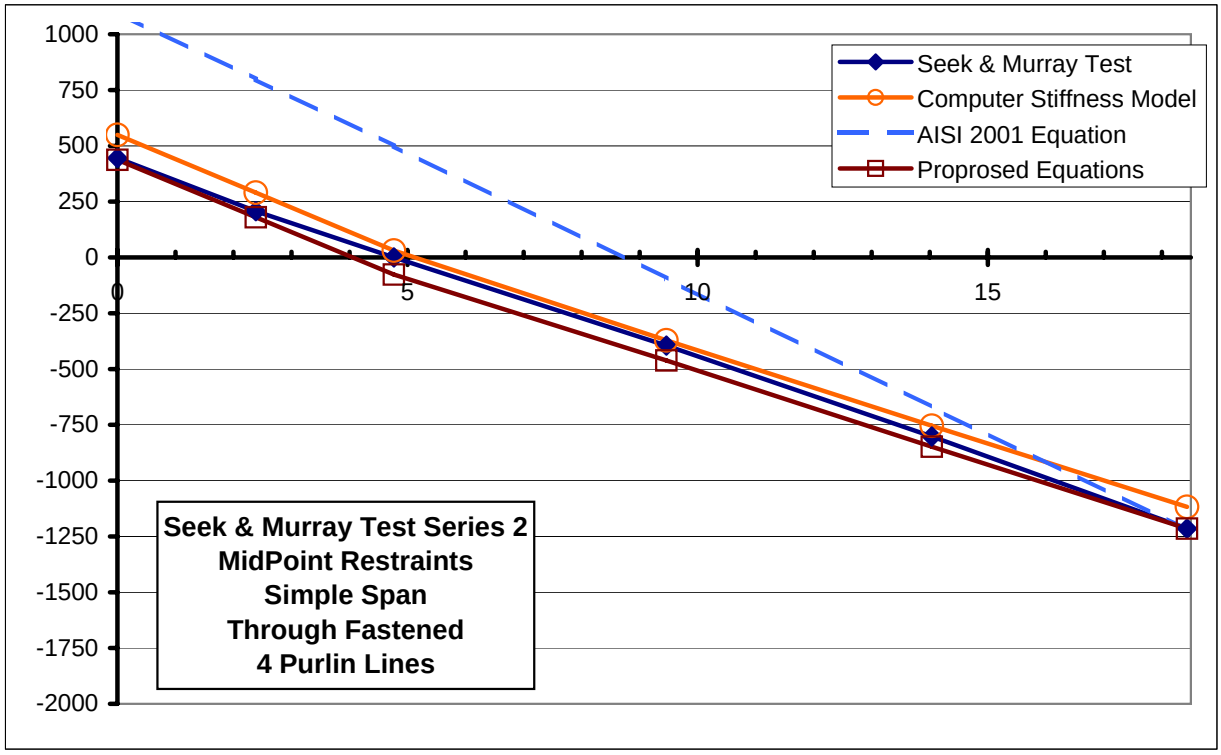
Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	55	1_3Restraints	1@1	TribFirst	3.75
Load_	21.67 psf	1_4Restraints	--	TribLast	3.75
RestraintType1	12kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Seek2/5	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.5	ClipStiffness	100000	Notes	Seek - Series 2

Purlin Restraint Model/Test Comparison

Test Series: 2
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Through Fastened

Total Weight: 7150lbs
Purlin Designation: 10Z0.097
Bracing Configuration: MidPoint

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	445	549	1096	437
2.39	207	290	798	180
4.76	0	31	499	-77
9.46	-395	-372	-94	-461
14.04	-802	-754	-671	-848
18.43	-1215	-1118	-1221	-1215



Input Summary:

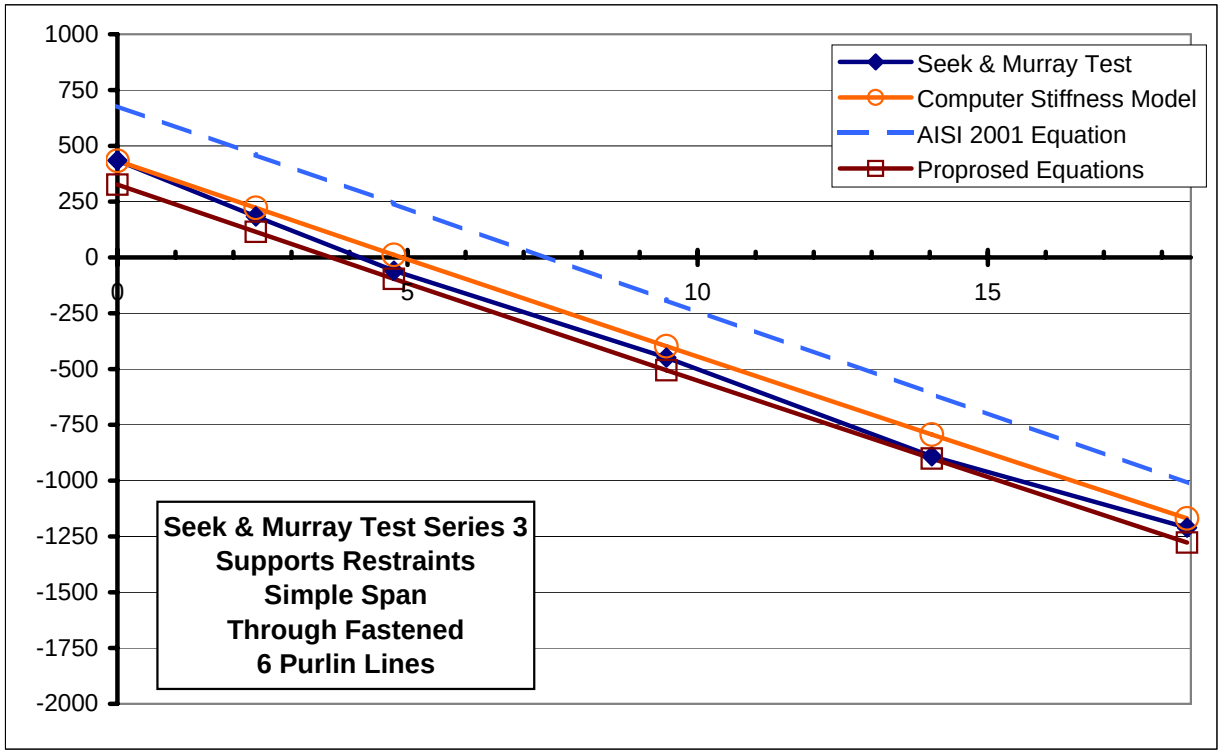
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	151	1_3Restraints	--	TribFirst	3.75
Load_	21.67 psf	1_4Restraints	--	TribLast	3.75
RestraintType1	18kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	18kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Seek2/5	PanelIx	0.039	InactiveTruss	FALSE
Spaces	3@4.5	ClipStiffness	100000	Notes	Seek - Series 2

Purlin Restraint Model/Test Comparison

Test Series: 3
Span Length: 1@20ft
Number of Purlins: 6
Deck Type: Through Fastened

Total Weight: 10460lbs
Purlin Designation: 10Z0.097
Bracing Configuration: Supports

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	435	433	678	326
2.39	184	222	459	115
4.76	-60	12	241	-96
9.46	-449	-398	-191	-505
14.04	-891	-793	-611	-901
18.43	-1211	-1169	-1011	-1277



Input Summary:

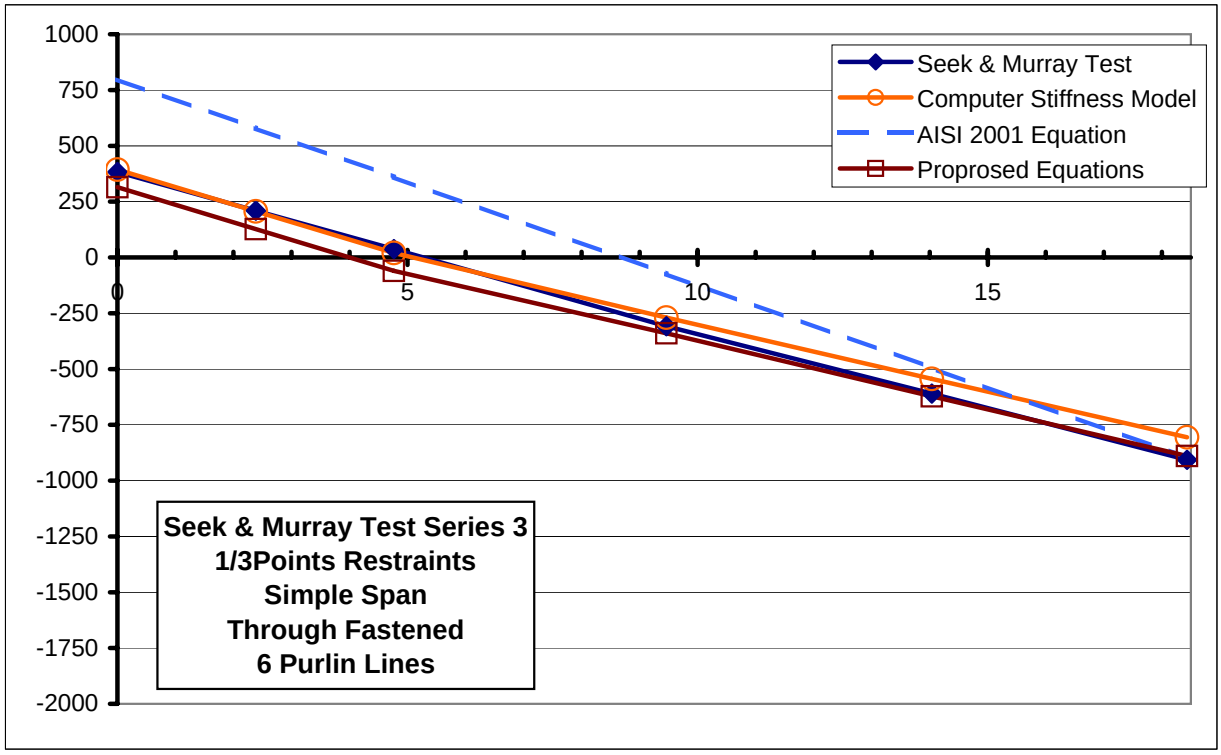
Ref Node	101103	SupRestraints	1@1-2	PanelConnStiff	1500
Index	13	1_3Restraints	--	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	142kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	142kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Seek3/6	PanelIx	0.039	InactiveTruss	FALSE
Spaces	5@4.5	ClipStiffness	100000	Notes	Seek - Series 3

Purlin Restraint Model/Test Comparison

Test Series: 3
Span Length: 1@20ft
Number of Purlins: 6
Deck Type: Through Fastened

Total Weight: 10460lbs
Purlin Designation: 10Z0.097
Bracing Configuration: 1/3Points

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	383	394	797	315
2.39	209	207	578	127
4.76	38	20	360	-60
9.46	-308	-269	-74	-340
14.04	-610	-544	-495	-622
18.43	-907	-806	-898	-890



Input Summary:

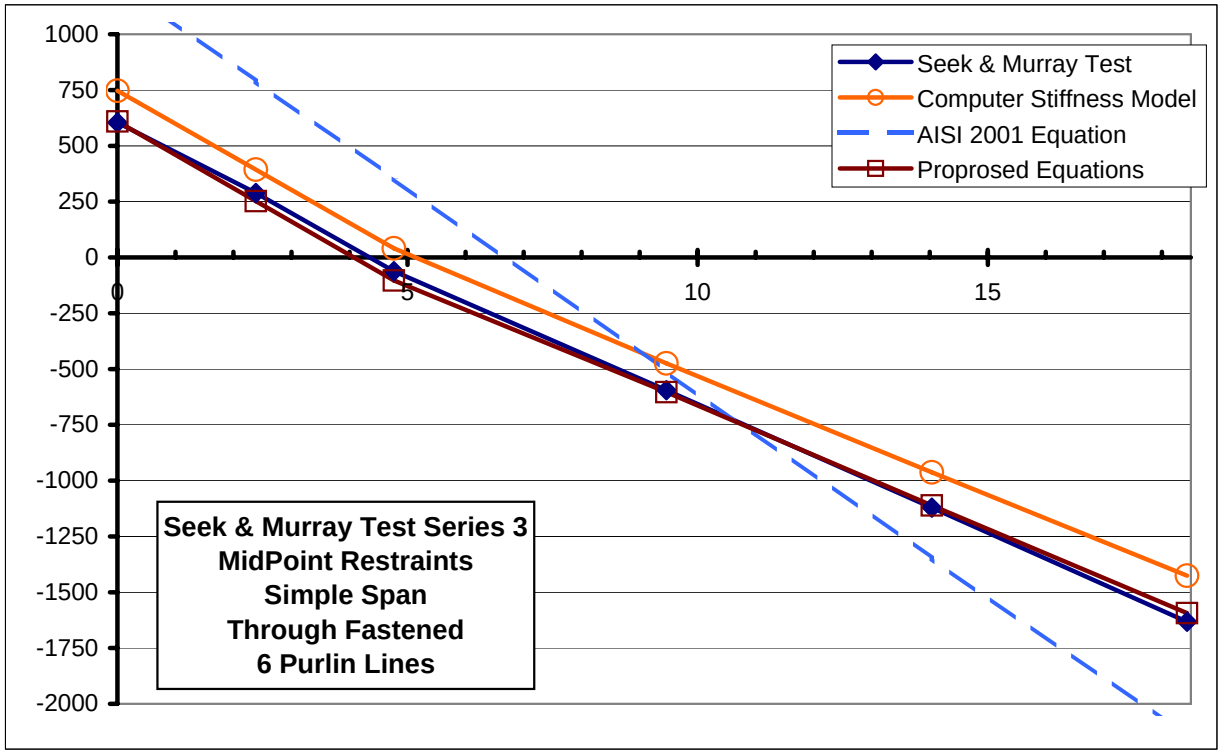
Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	61	1_3Restraints	1@1	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	12kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Seek3/6	PanelIx	0.039	InactiveTruss	FALSE
Spaces	5@4.5	ClipStiffness	100000	Notes	Seek - Series 3

Purlin Restraint Model/Test Comparison

Test Series: 3
Span Length: 1@20ft
Number of Purlins: 6
Deck Type: Through Fastened

Total Weight: 10460lbs
Purlin Designation: 10Z0.097
Bracing Configuration: MidPoint

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	604	747	1226	609
2.39	289	394	789	253
4.76	-61	41	353	-104
9.46	-595	-475	-511	-603
14.04	-1121	-962	-1348	-1111
18.43	-1632	-1426	-2145	-1593



Input Summary:

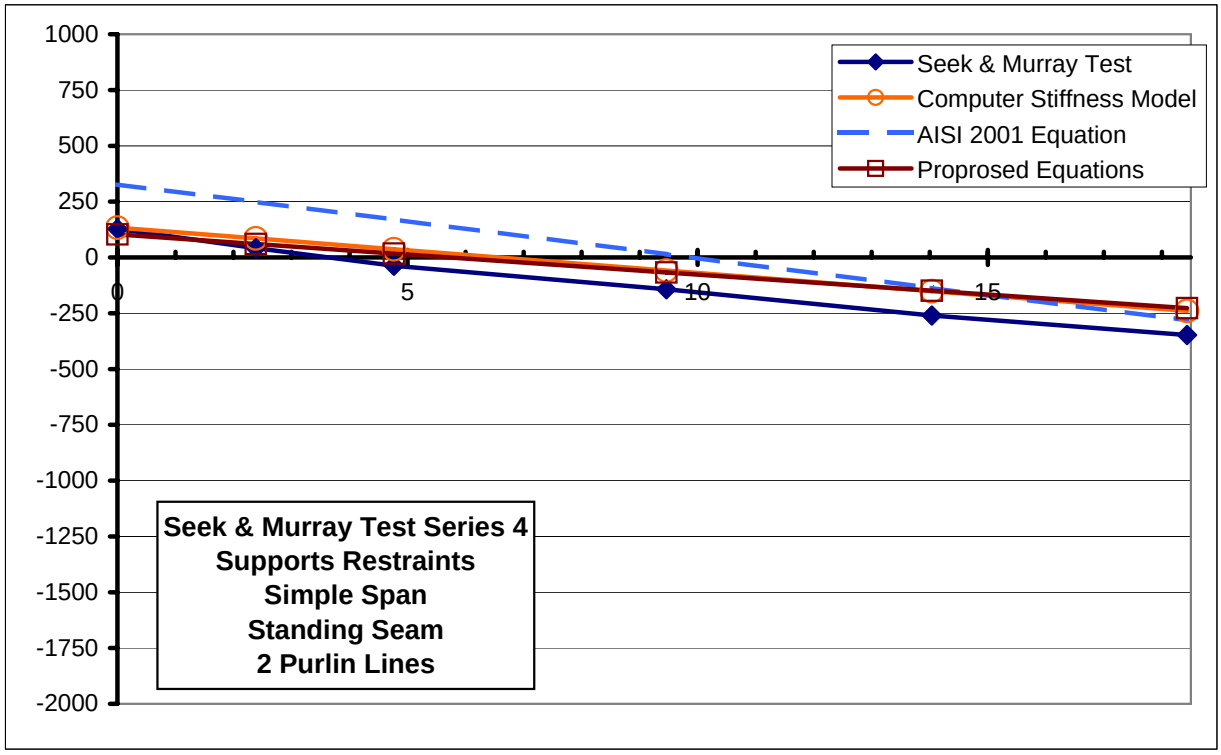
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	157	1_3Restraints	--	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	18kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	18kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.217	CFactor	0.08333
Purlins	Seek3/6	PanelIx	0.039	InactiveTruss	FALSE
Spaces	5@4.5	ClipStiffness	100000	Notes	Seek - Series 3

Purlin Restraint Model/Test Comparison

Test Series: 4
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Standing Seam

Total Weight: 3400lbs
Purlin Designation: 10Z0.097
Bracing Configuration: Supports

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	128	134	327	103
2.39	42	85	248	60
4.76	-38	37	170	17
9.46	-143	-59	15	-67
14.04	-260	-151	-137	-149
18.43	-348	-239	-282	-227



Input Summary:

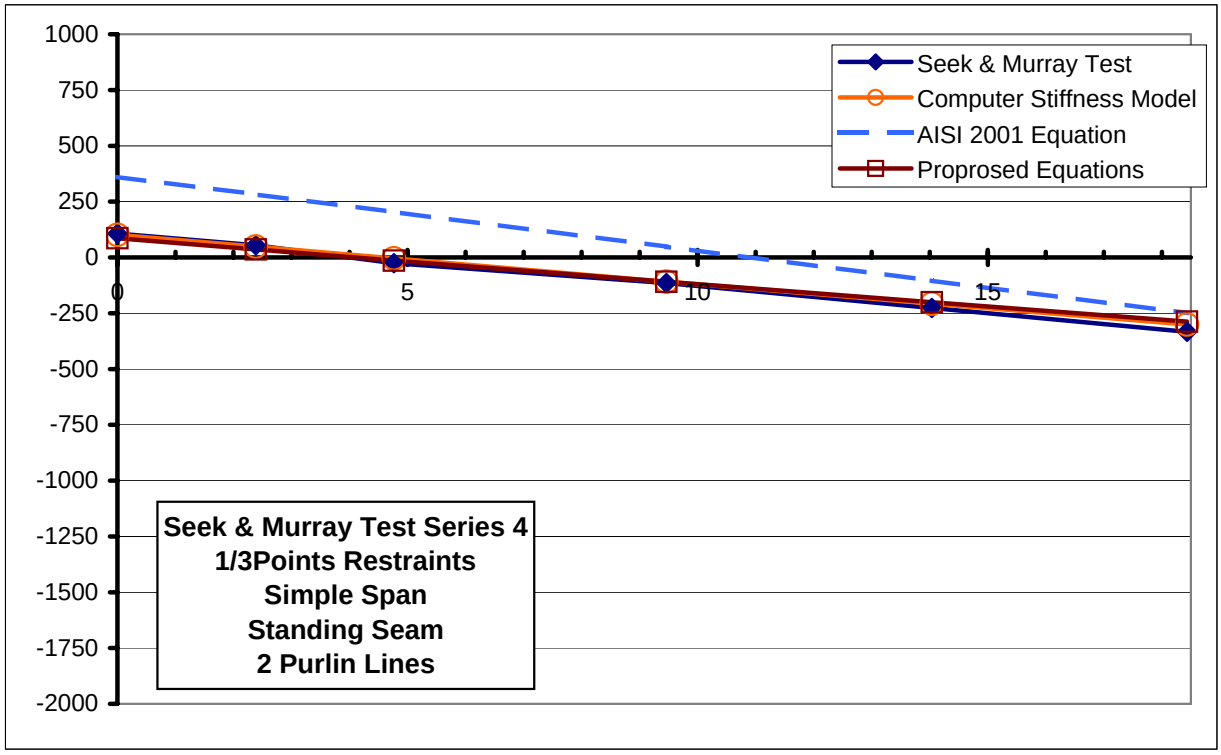
Ref Node	101103	SupRestraints	1@1-2	PanelConnStiff	1500
Index	19	1_3Restraints	--	TribFirst	3.75
Load_	22.67 psf	1_4Restraints	--	TribLast	3.75
RestraintType1	38kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	38kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Seek1/4	PanelIx	0.12	InactiveTruss	TRUE
Spaces	1@4.5	ClipStiffness	5000	Notes	Seek - Series 4

Purlin Restraint Model/Test Comparison

Test Series: 4
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Standing Seam

Total Weight: 3400lbs
Purlin Designation: 10Z0.097
Bracing Configuration: 1/3Points

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	107	101	360	86
2.39	55	49	282	36
4.76	-26	-4	204	-14
9.46	-115	-109	48	-109
14.04	-227	-207	-104	-201
18.43	-333	-300	-250	-288



Input Summary:

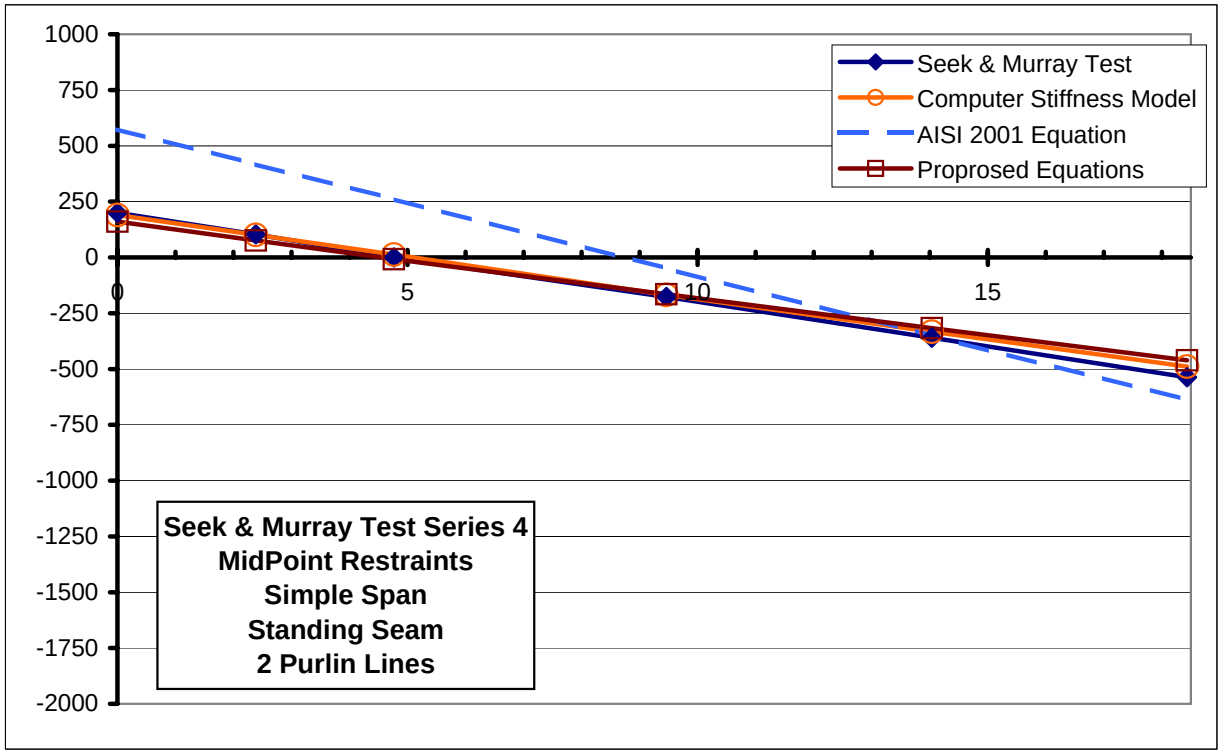
Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	67	1_3Restraints	1@1	TribFirst	3.75
Load_	22.67 psf	1_4Restraints	--	TribLast	3.75
RestraintType1	9.8kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	9.8kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Seek1/4	PanelIx	0.12	InactiveTruss	TRUE
Spaces	1@4.5	ClipStiffness	5000	Notes	Seek - Series 4

Purlin Restraint Model/Test Comparison

Test Series: 4
Span Length: 1@20ft
Number of Purlins: 2
Deck Type: Standing Seam

Total Weight: 3400lbs
Purlin Designation: 10Z0.097
Bracing Configuration: MidPoint

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	200	190	573	161
2.39	103	101	417	76
4.76	0	13	261	-8
9.46	-177	-168	-49	-165
14.04	-360	-333	-351	-317
18.43	-537	-489	-639	-461



Input Summary:

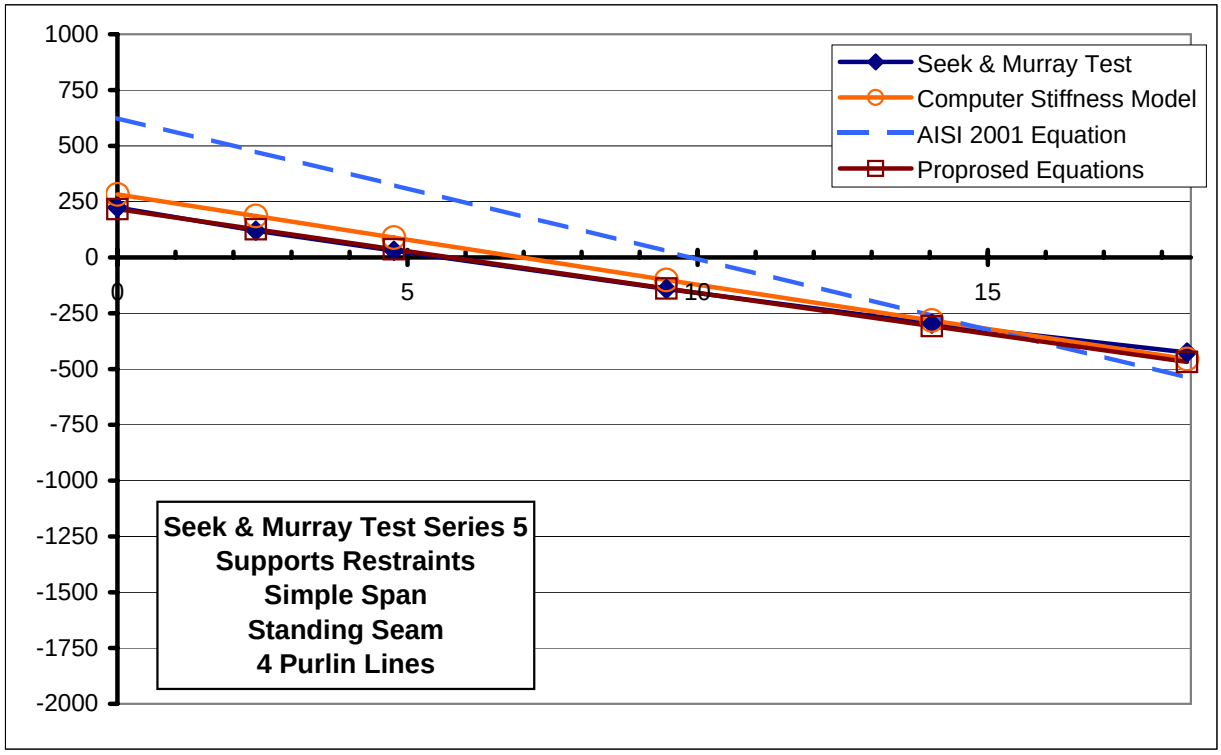
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	163	1_3Restraints	--	TribFirst	3.75
Load_	22.67 psf	1_4Restraints	--	TribLast	3.75
RestraintType1	13kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	13kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Seek1/4	PanelIx	0.12	InactiveTruss	TRUE
Spaces	1@4.5	ClipStiffness	5000	Notes	Seek - Series 4

Purlin Restraint Model/Test Comparison

Test Series: 5
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Standing Seam

Total Weight: 7150lbs
Purlin Designation: 10Z0.097
Bracing Configuration: Supports

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	224	283	624	217
2.39	120	186	475	127
4.76	30	89	325	36
9.46	-142	-101	28	-139
14.04	-297	-282	-261	-308
18.43	-426	-455	-538	-468



Input Summary:

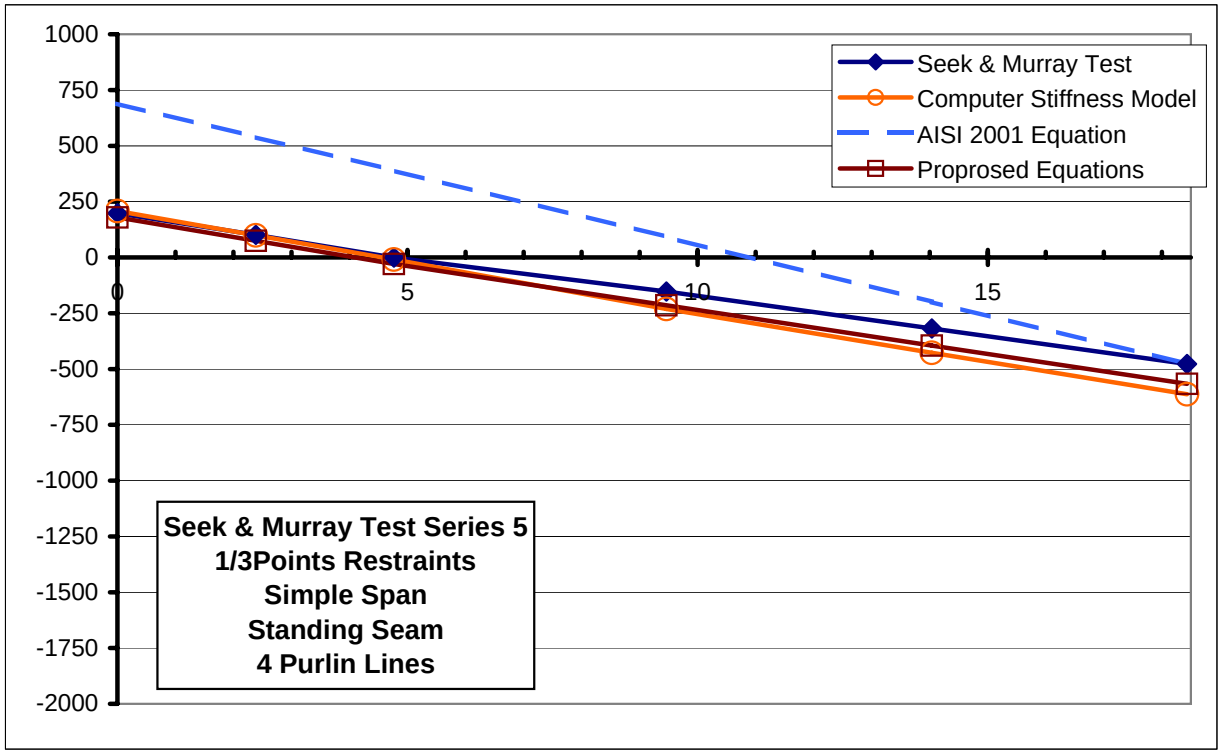
Ref Node	101103	SupRestraints	1@1-2	PanelConnStiff	1500
Index	25	1_3Restraints	--	TribFirst	3.25
Load_	22.34 psf	1_4Restraints	--	TribLast	3.75
RestraintType1	142kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	142kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Seek2/5	PanelIx	0.12	InactiveTruss	TRUE
Spaces	3@4.5	ClipStiffness	5000	Notes	Seek - Series 5

Purlin Restraint Model/Test Comparison

Test Series: 5
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Standing Seam

Total Weight: 7150lbs
Purlin Designation: 10Z0.097
Bracing Configuration: 1/3Points

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	198	208	689	179
2.39	101	99	539	75
4.76	-1	-9	389	-29
9.46	-153	-231	92	-214
14.04	-318	-427	-199	-395
18.43	-478	-613	-477	-567



Input Summary:

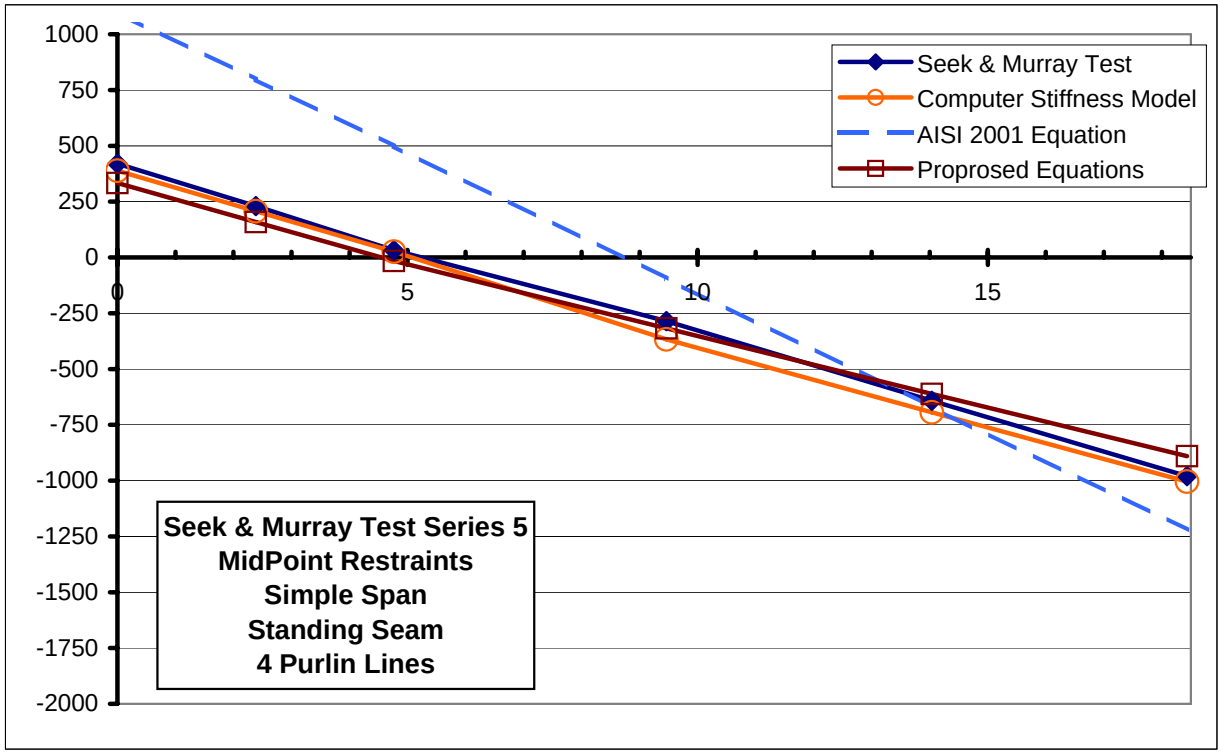
Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	73	1_3Restraints	1@1	TribFirst	3.25
Load_	22.34 psf	1_4Restraints	--	TribLast	3.75
RestraintType1	12kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Seek2/5	PanelIx	0.12	InactiveTruss	TRUE
Spaces	3@4.5	ClipStiffness	5000	Notes	Seek - Series 5

Purlin Restraint Model/Test Comparison

Test Series: 5
Span Length: 1@20ft
Number of Purlins: 4
Deck Type: Standing Seam

Total Weight: 7150lbs
Purlin Designation: 10Z0.097
Bracing Configuration: MidPoint

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	420	389	1096	333
2.39	230	207	797	159
4.76	32	26	498	-15
9.46	-285	-367	-94	-318
14.04	-642	-694	-671	-611
18.43	-980	-1004	-1221	-890



Input Summary:

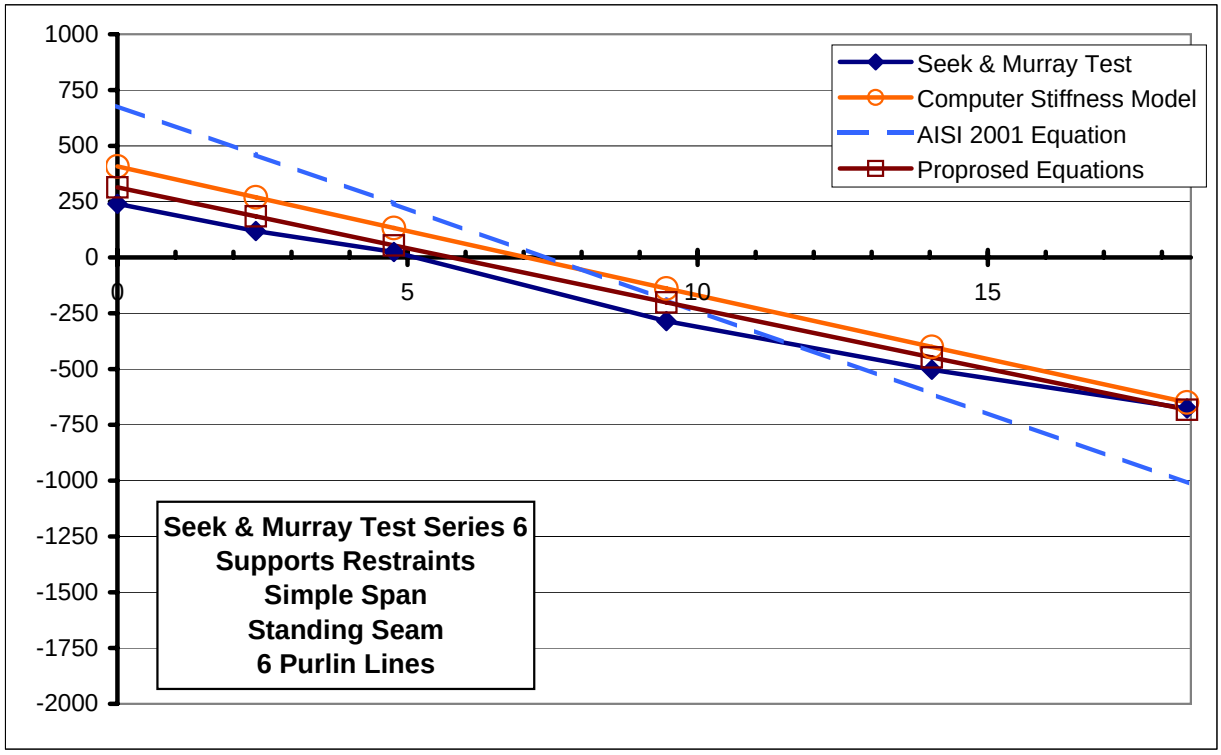
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	169	1_3Restraints	--	TribFirst	3.25
Load_	22.34 psf	1_4Restraints	--	TribLast	3.75
RestraintType1	18kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	18kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Seek2/5	PanelIx	0.12	InactiveTruss	TRUE
Spaces	3@4.5	ClipStiffness	5000	Notes	Seek - Series 5

Purlin Restraint Model/Test Comparison

Test Series: 6
Span Length: 1@20ft
Number of Purlins: 6
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 10Z0.097
Bracing Configuration: Supports

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	241	408	678	314
2.39	119	270	459	184
4.76	25	132	241	54
9.46	-285	-139	-191	-201
14.04	-504	-401	-611	-448
18.43	-677	-650	-1011	-682



Input Summary:

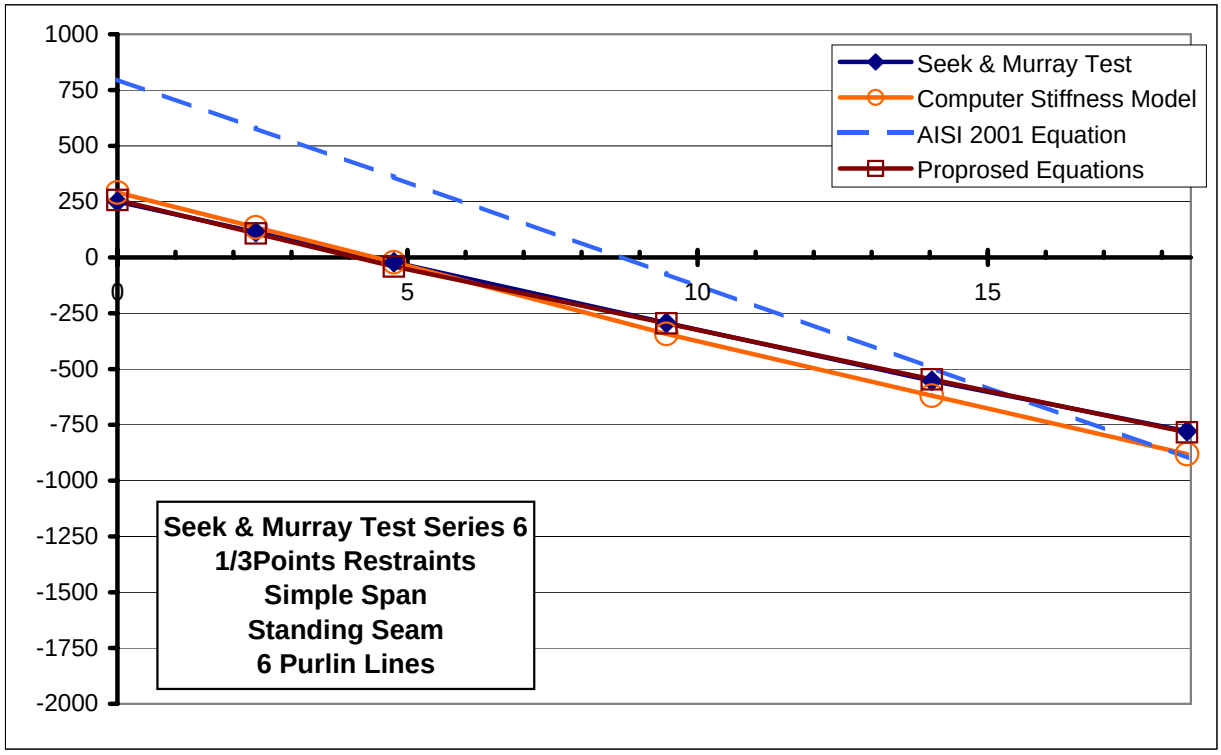
Ref Node	101103	SupRestraints	1@1-2	PanelConnStiff	1500
Index	31	1_3Restraints	--	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	142kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	142kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Seek3/6	PanelIx	0.12	InactiveTruss	TRUE
Spaces	5@4.5	ClipStiffness	5000	Notes	Seek - Series 6

Purlin Restraint Model/Test Comparison

Test Series: 6
Span Length: 1@20ft
Number of Purlins: 6
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 10Z0.097
Bracing Configuration: 1/3Points

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	250	291	797	257
2.39	113	135	578	108
4.76	-22	-21	360	-41
9.46	-294	-343	-74	-296
14.04	-553	-619	-495	-546
18.43	-779	-881	-898	-784



Input Summary:

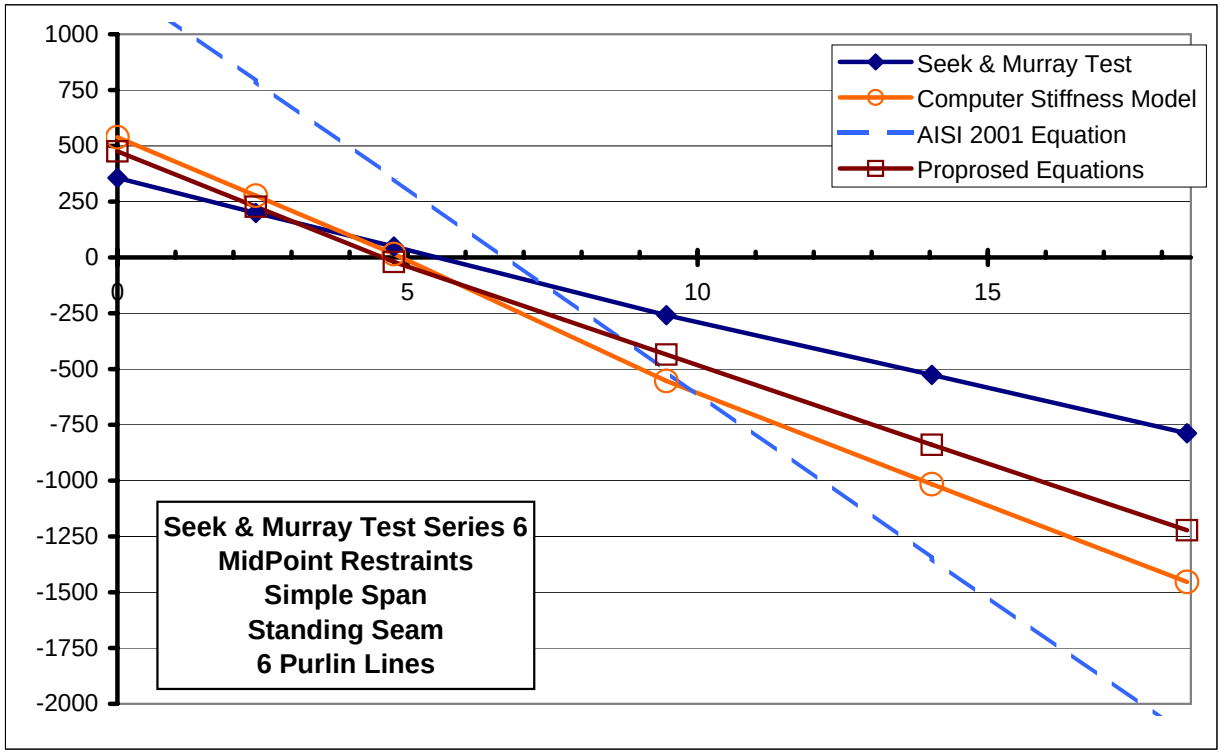
Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	79	1_3Restraints	1@1	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	12kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Seek3/6	PanelIx	0.12	InactiveTruss	TRUE
Spaces	5@4.5	ClipStiffness	5000	Notes	Seek - Series 6

Purlin Restraint Model/Test Comparison

Test Series: 6
Span Length: 1@20ft
Number of Purlins: 6
Deck Type: Standing Seam

Total Weight: 10460lbs
Purlin Designation: 10Z0.097
Bracing Configuration: MidPoint

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	356	538	1226	475
2.39	199	276	789	227
4.76	49	15	353	-20
9.46	-259	-553	-511	-435
14.04	-526	-1015	-1348	-839
18.43	-788	-1454	-2145	-1223



Input Summary:

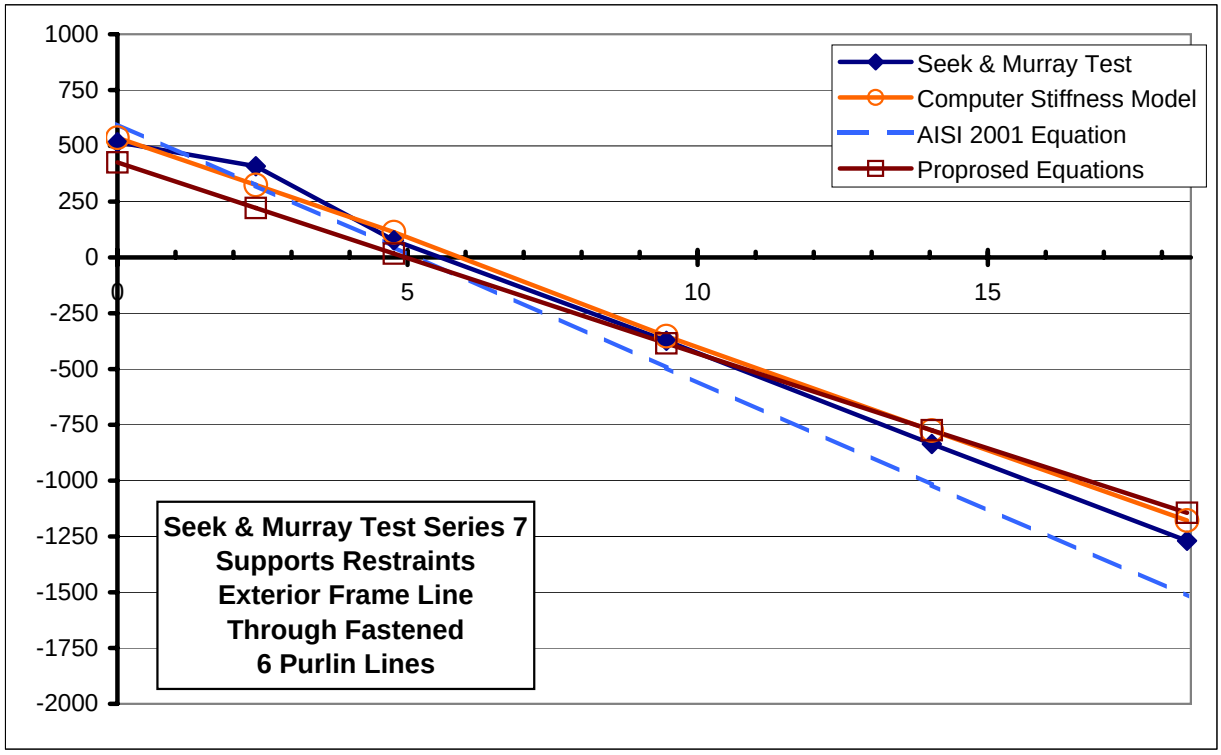
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	175	1_3Restraints	--	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	18kpi	MidRestraints	1@1	LoadOffset	4.5
RestraintType2	18kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	1@20	PanelArea	0.288	CFactor	0.08333
Purlins	Seek3/6	PanelIx	0.12	InactiveTruss	TRUE
Spaces	5@4.5	ClipStiffness	5000	Notes	Seek - Series 6

Purlin Restraint Model/Test Comparison

Test Series: 7
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Through Fastened

Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: Supports

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	516	536	597	426
2.39	408	325	322	221
4.76	77	114	48	17
9.46	-374	-352	-495	-385
14.04	-836	-776	-1019	-774
18.43	-1270	-1179	-1518	-1144



Input Summary:

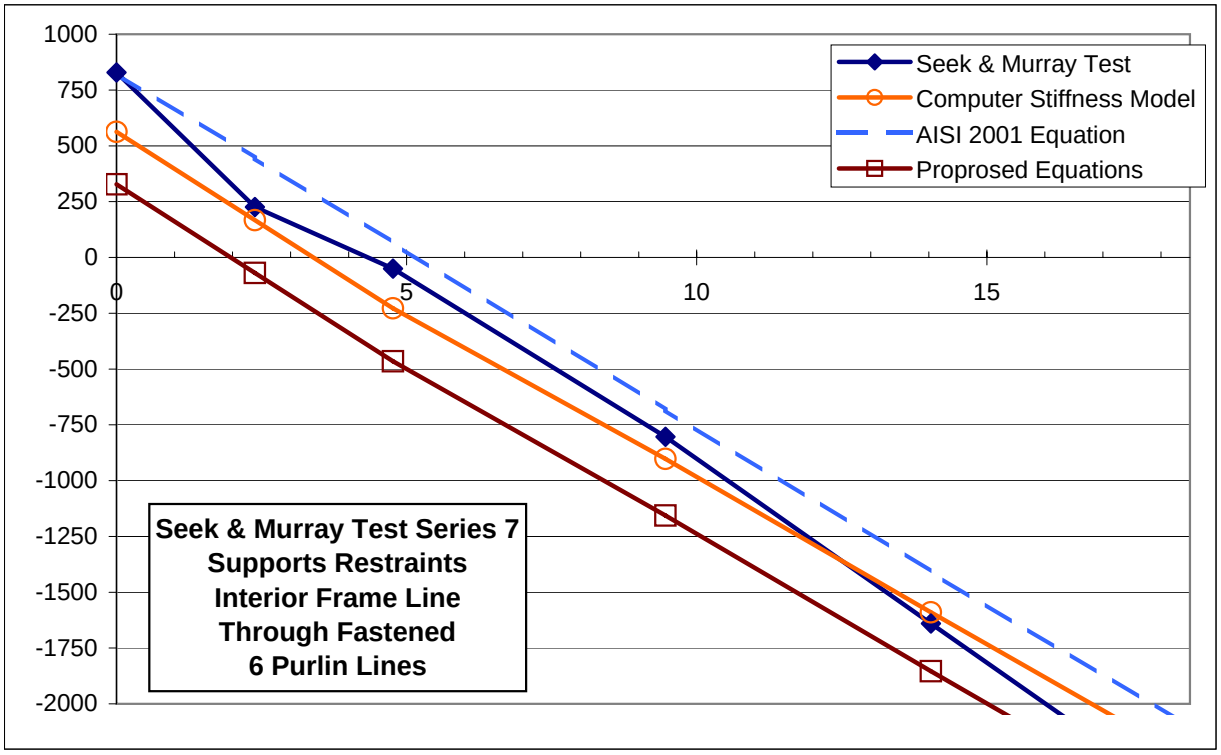
Ref Node	101103	SupRestraints	1@1-4	PanelConnStiff	1500
Index	37	1_3Restraints	--	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	142kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	142kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.039	InactiveTruss	FALSE
Spaces	5@4.5	ClipStiffness	100000	Notes	Seek - Series 7

Purlin Restraint Model/Test Comparison

Test Series: 7
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Through Fastened

Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: Supports

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	829	563	824	327
2.39	226	167	445	-70
4.76	-50	-228	66	-466
9.46	-804	-902	-683	-1157
14.04	-1640	-1590	-1408	-1854
18.43	-2441	-2241	-2096	-2513



Input Summary:

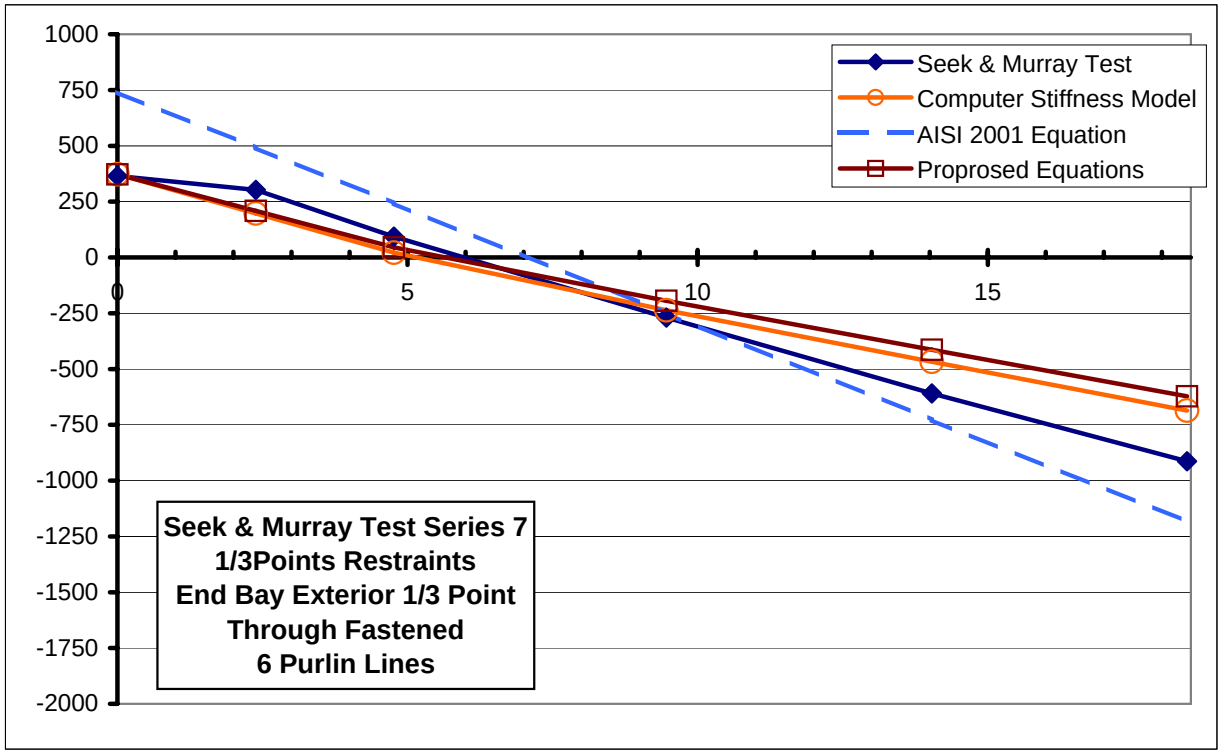
Ref Node	111125	SupRestraints	1@1-4	PanelConnStiff	1500
Index	37	1_3Restraints	--	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	142kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	142kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.039	InactiveTruss	FALSE
Spaces	5@4.5	ClipStiffness	100000	Notes	Seek - Series 7

Purlin Restraint Model/Test Comparison

Test Series: 7
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Through Fastened

Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: 1/3Points

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	365	373	740	372
2.39	303	197	491	208
4.76	94	22	242	45
9.46	-270	-237	-251	-195
14.04	-609	-467	-729	-414
18.43	-913	-686	-1184	-622



Input Summary:

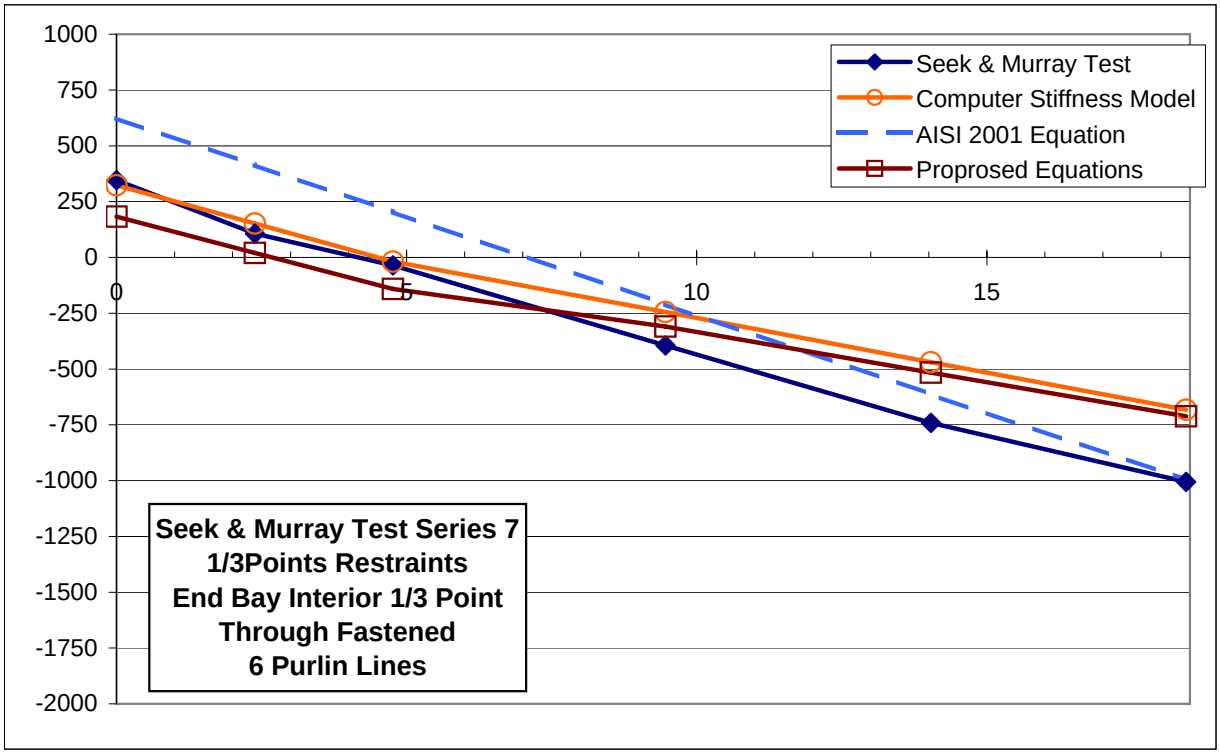
Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	85	1_3Restraints	1@1-3	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	12kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.039	InactiveTruss	FALSE
Spaces	5@4.5	ClipStiffness	100000	Notes	Seek - Series 7

Purlin Restraint Model/Test Comparison

Test Series: 7
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Through Fastened

Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: 1/3Points

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	346	323	623	183
2.39	107	152	413	20
4.76	-36	-19	204	-141
9.46	-395	-245	-211	-309
14.04	-742	-469	-614	-516
18.43	-1006	-682	-997	-712



Input Summary:

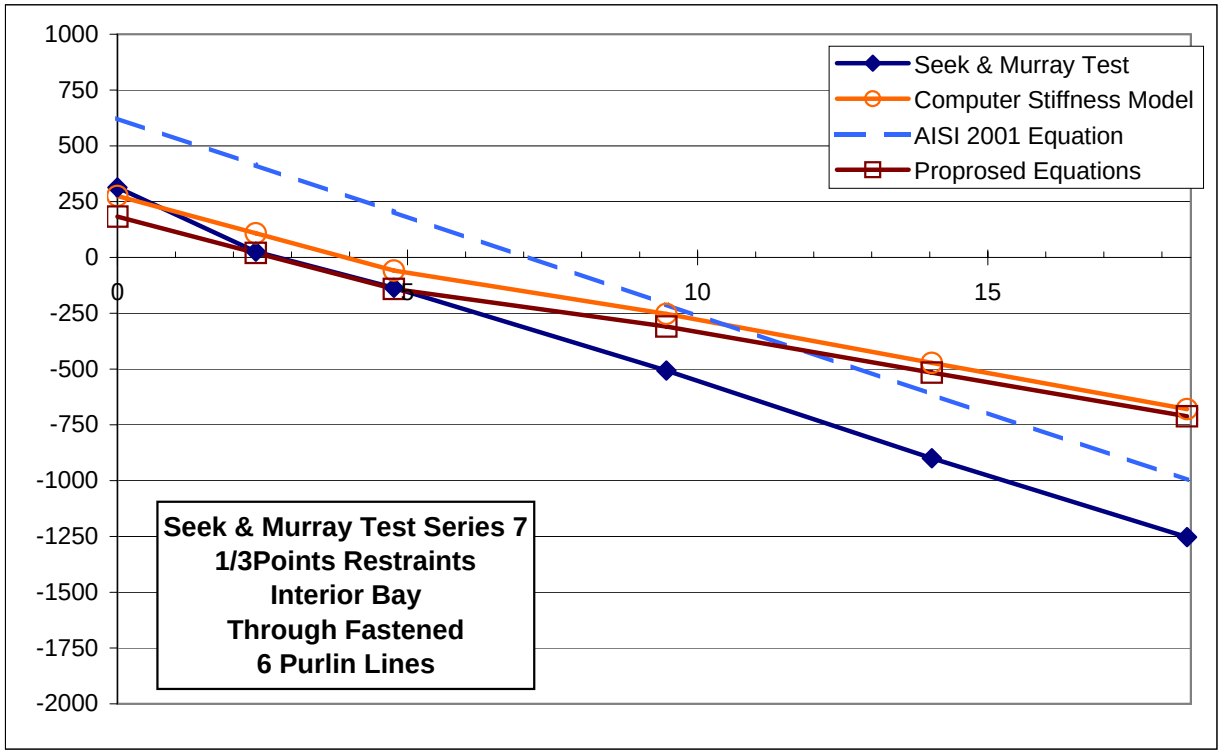
Ref Node	111116	SupRestraints	--	PanelConnStiff	1500
Index	85	1_3Restraints	1@1-3	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	12kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.039	InactiveTruss	FALSE
Spaces	5@4.5	ClipStiffness	100000	Notes	Seek - Series 7

Purlin Restraint Model/Test Comparison

Test Series: 7
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Through Fastened

Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: 1/3Points

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	314	275	623	183
2.39	26	108	413	20
4.76	-136	-59	204	-141
9.46	-507	-253	-211	-309
14.04	-900	-472	-614	-516
18.43	-1253	-680	-997	-712



Input Summary:

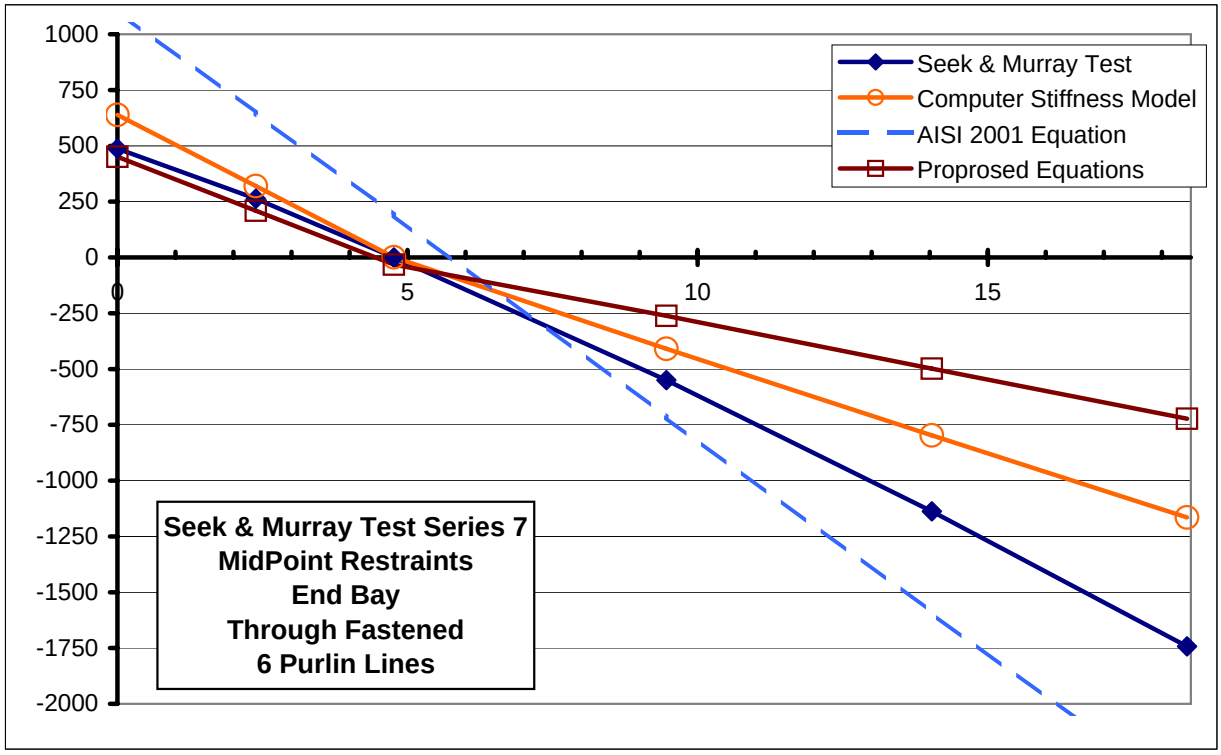
Ref Node	121108	SupRestraints	--	PanelConnStiff	1500
Index	85	1_3Restraints	1@1-3	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	12kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.039	InactiveTruss	FALSE
Spaces	5@4.5	ClipStiffness	100000	Notes	Seek - Series 7

Purlin Restraint Model/Test Comparison

Test Series: 7
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Through Fastened

Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: MidPoint

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	488	638	1105	451
2.39	263	319	647	209
4.76	0	1	189	-33
9.46	-550	-409	-716	-262
14.04	-1138	-797	-1592	-498
18.43	-1743	-1165	-2425	-723



Input Summary:

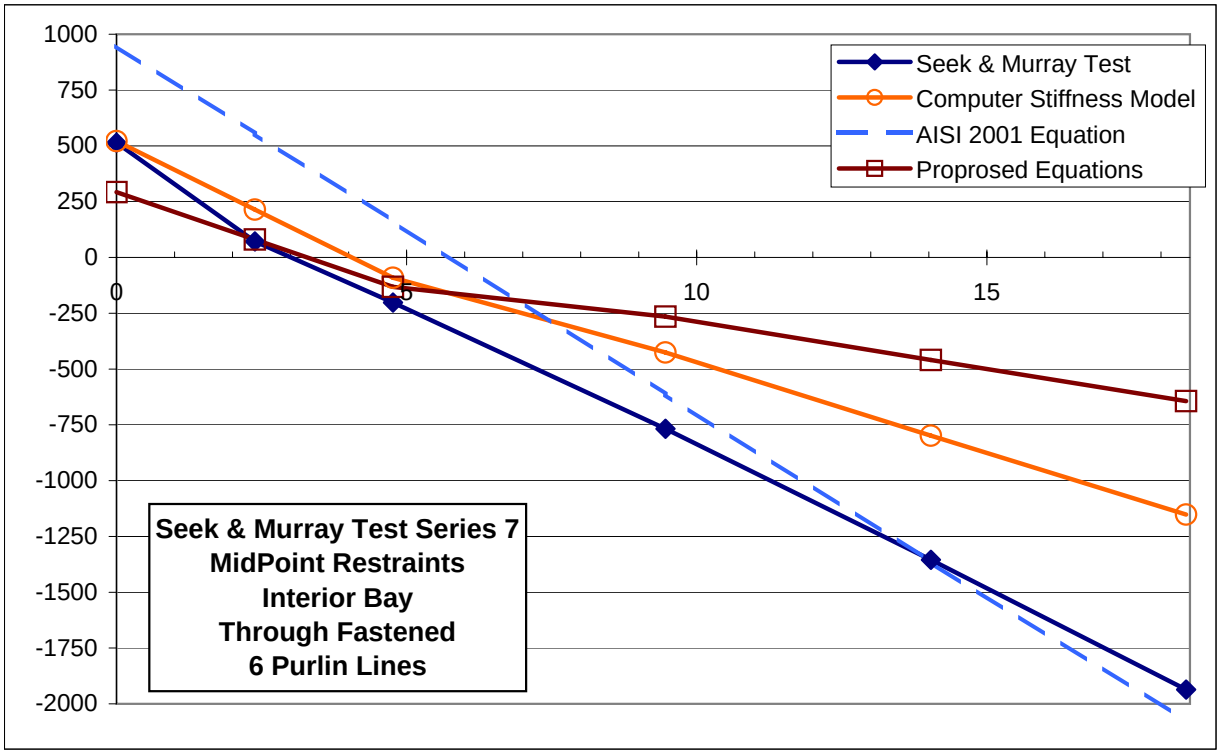
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	181	1_3Restraints	--	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	18kpi	MidRestraints	1@1-3	LoadOffset	4.5
RestraintType2	18kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.039	InactiveTruss	FALSE
Spaces	5@4.5	ClipStiffness	100000	Notes	Seek - Series 7

Purlin Restraint Model/Test Comparison

Test Series: 7
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Through Fastened

Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: MidPoint

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	514	521	947	293
2.39	72	215	554	80
4.76	-202	-91	162	-132
9.46	-768	-426	-614	-265
14.04	-1355	-798	-1365	-460
18.43	-1936	-1152	-2079	-644



Input Summary:

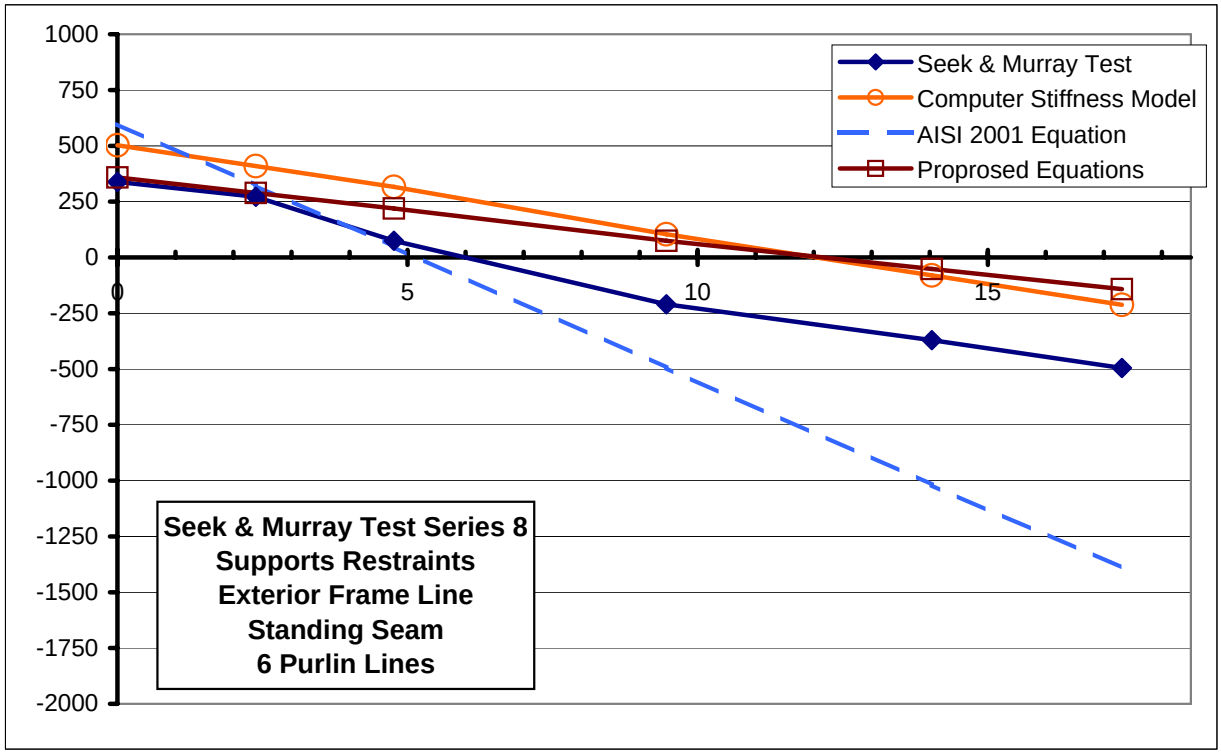
Ref Node	121112	SupRestraints	--	PanelConnStiff	1500
Index	181	1_3Restraints	--	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	18kpi	MidRestraints	1@1-3	LoadOffset	4.5
RestraintType2	18kpi	ShearStiff	27500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.217	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.039	InactiveTruss	FALSE
Spaces	5@4.5	ClipStiffness	100000	Notes	Seek - Series 7

Purlin Restraint Model/Test Comparison

Test Series: 8
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Standing Seam

Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: Supports

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	339	502	597	358
2.39	272	409	322	289
4.76	75	316	48	219
9.46	-210	104	-495	75
14.04	-371	-80	-1019	-52
17.31	-496	-212	-1391	-142



Input Summary:

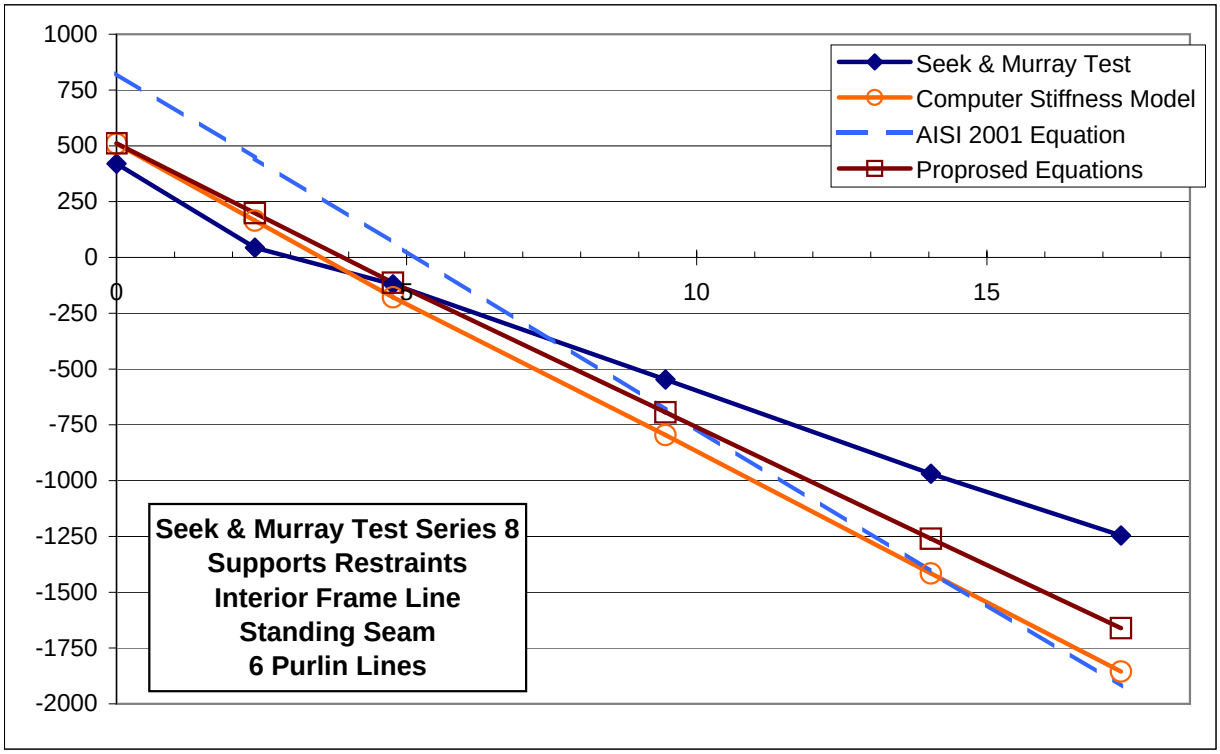
Ref Node	101103	SupRestraints	1@1-4	PanelConnStiff	1500
Index	43	1_3Restraints	--	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	142kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	142kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.288	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.12	InactiveTruss	TRUE
Spaces	5@4.5	ClipStiffness	5000	Notes	Seek - Series 8

Purlin Restraint Model/Test Comparison

Test Series: 8
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Standing Seam

Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: Supports

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	420	509	824	511
2.39	44	165	445	199
4.76	-121	-178	66	-113
9.46	-547	-795	-683	-694
14.04	-969	-1416	-1408	-1261
17.31	-1246	-1855	-1921	-1661



Input Summary:

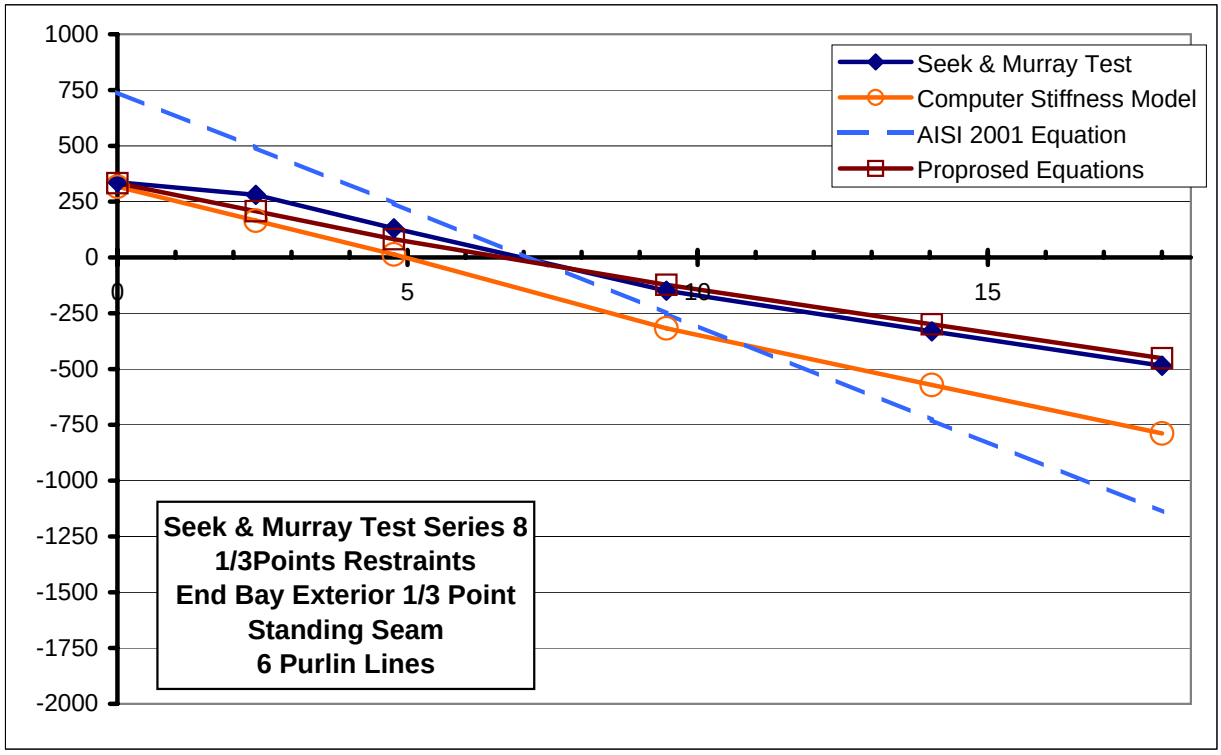
Ref Node	111125	SupRestraints	1@1-4	PanelConnStiff	1500
Index	43	1_3Restraints	--	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	142kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	142kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.288	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.12	InactiveTruss	TRUE
Spaces	5@4.5	ClipStiffness	5000	Notes	Seek - Series 8

Purlin Restraint Model/Test Comparison

Test Series: 8
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Standing Seam

Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: 1/3Points

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	337	317	740	333
2.39	281	165	491	207
4.76	131	14	242	81
9.46	-149	-317	-251	-123
14.04	-332	-571	-729	-299
18.00	-485	-789	-1140	-451



Input Summary:

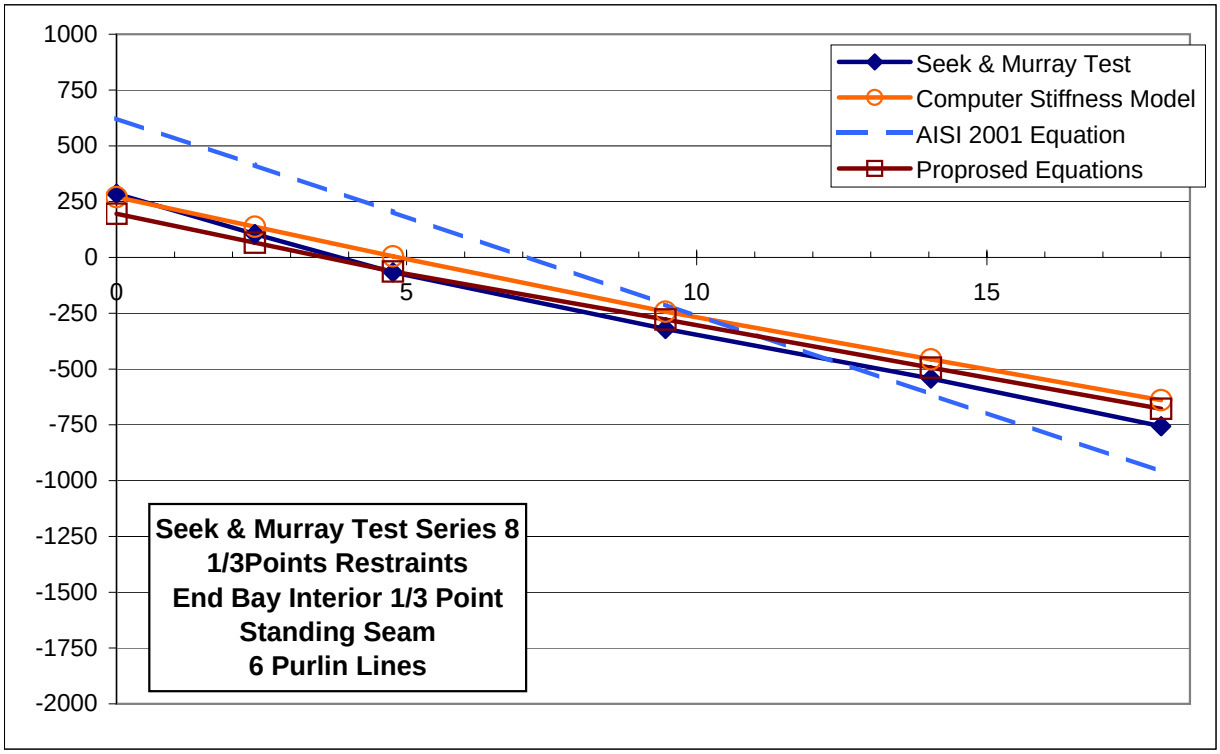
Ref Node	111108	SupRestraints	--	PanelConnStiff	1500
Index	91	1_3Restraints	1@1-3	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	12kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.288	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.12	InactiveTruss	TRUE
Spaces	5@4.5	ClipStiffness	5000	Notes	Seek - Series 8

Purlin Restraint Model/Test Comparison

Test Series: 8
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Standing Seam

Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: 1/3Points

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	286	270	623	196
2.39	105	137	413	66
4.76	-67	5	204	-63
9.46	-321	-243	-211	-278
14.04	-543	-456	-614	-494
18.00	-757	-639	-960	-678



Input Summary:

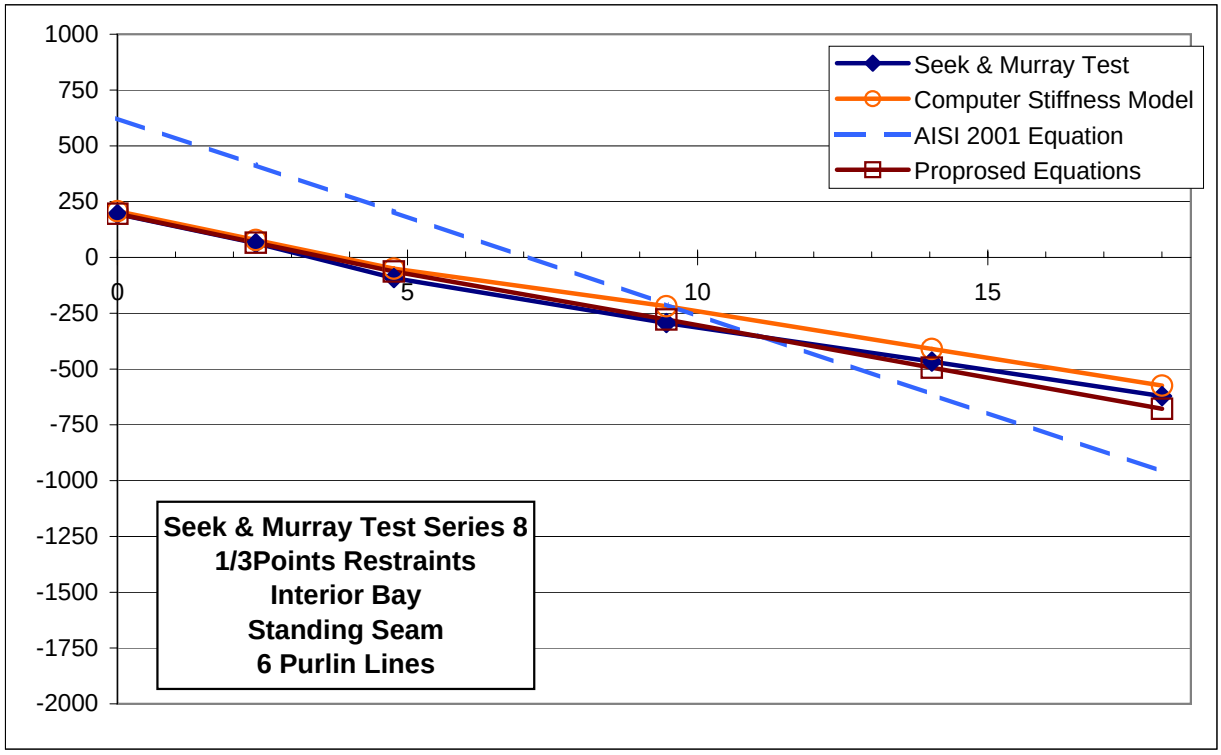
Ref Node	111116	SupRestraints	--	PanelConnStiff	1500
Index	91	1_3Restraints	1@1-3	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	12kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.288	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.12	InactiveTruss	TRUE
Spaces	5@4.5	ClipStiffness	5000	Notes	Seek - Series 8

Purlin Restraint Model/Test Comparison

Test Series: 8
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Standing Seam

Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: 1/3Points

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	194	207	623	196
2.39	64	78	413	66
4.76	-93	-50	204	-63
9.46	-294	-218	-211	-278
14.04	-467	-410	-614	-494
18.00	-622	-574	-960	-678



Input Summary:

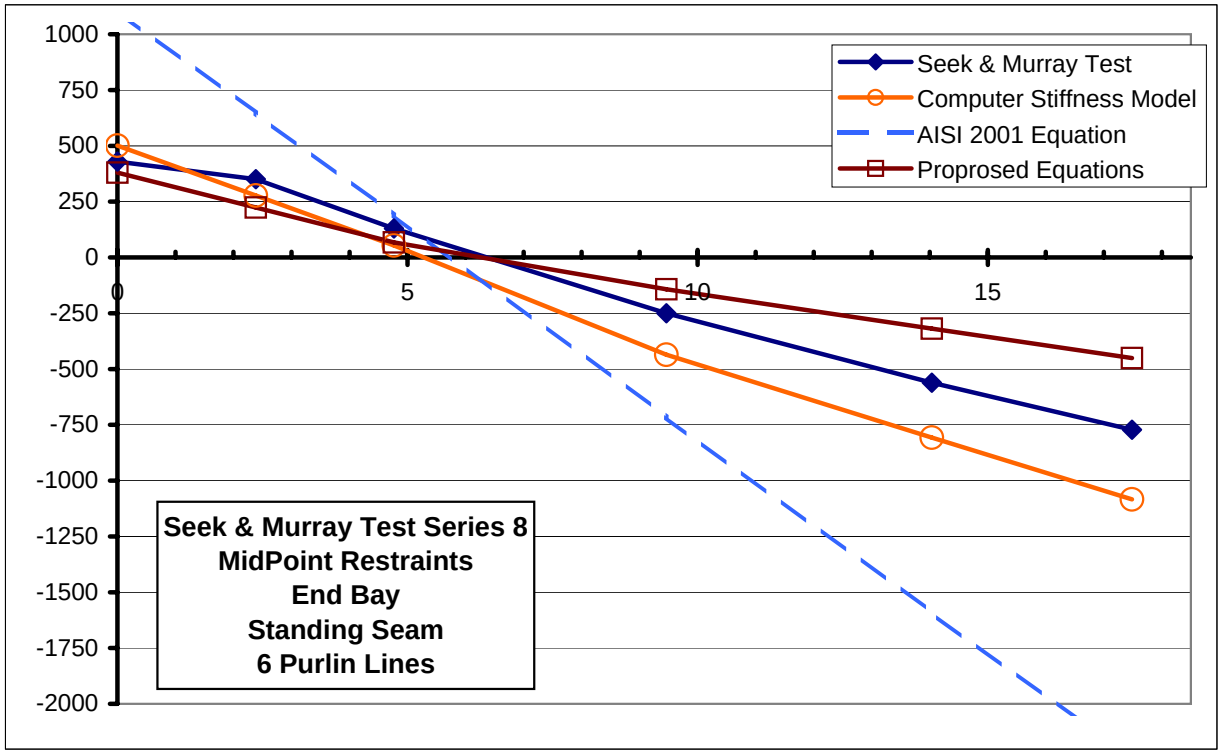
Ref Node	121108	SupRestraints	--	PanelConnStiff	1500
Index	91	1_3Restraints	1@1-3	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	12kpi	MidRestraints	--	LoadOffset	4.5
RestraintType2	12kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.288	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.12	InactiveTruss	TRUE
Spaces	5@4.5	ClipStiffness	5000	Notes	Seek - Series 8

Purlin Restraint Model/Test Comparison

Test Series: 8
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Standing Seam

Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: MidPoint

Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	430	501	1105	380
2.39	351	277	647	224
4.76	130	54	189	68
9.46	-250	-436	-716	-142
14.04	-561	-807	-1592	-319
17.48	-772	-1084	-2246	-451



Input Summary:

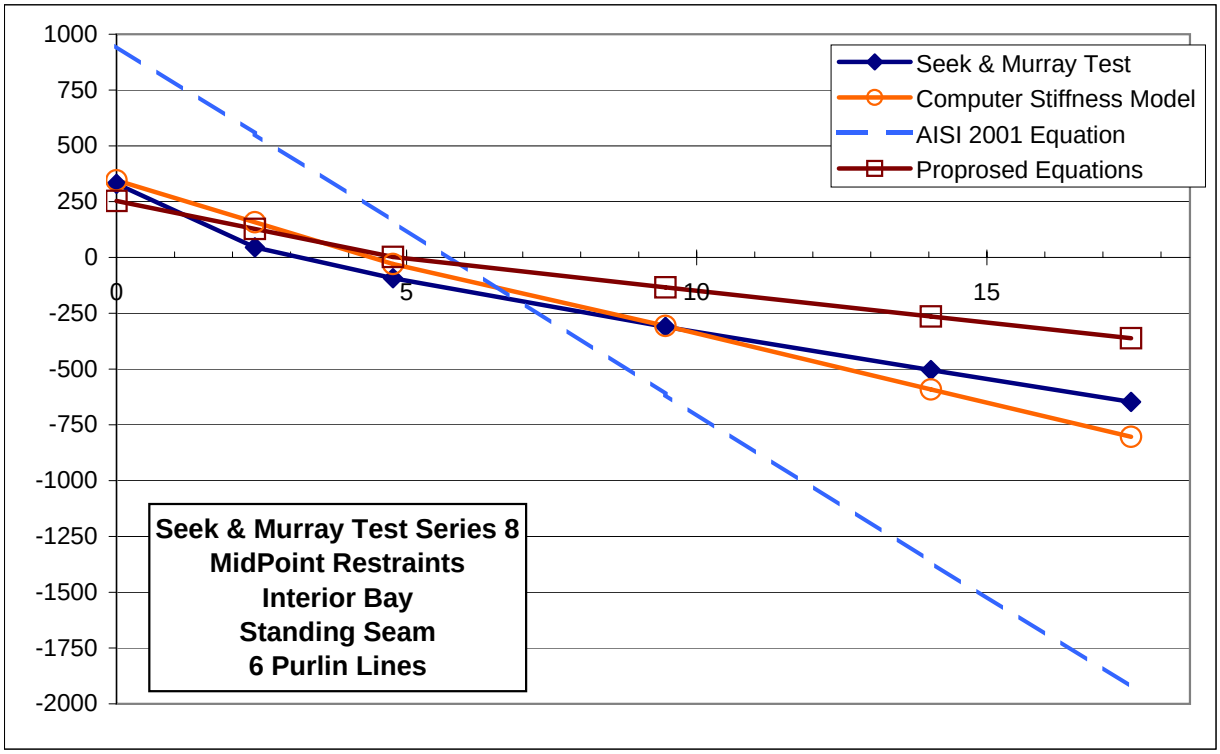
Ref Node	111112	SupRestraints	--	PanelConnStiff	1500
Index	187	1_3Restraints	--	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	18kpi	MidRestraints	1@1-3	LoadOffset	4.5
RestraintType2	18kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.288	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.12	InactiveTruss	TRUE
Spaces	5@4.5	ClipStiffness	5000	Notes	Seek - Series 8

Purlin Restraint Model/Test Comparison

Test Series: 8
Span Length: 3@20ft
Number of Purlins: 6
Deck Type: Standing Seam

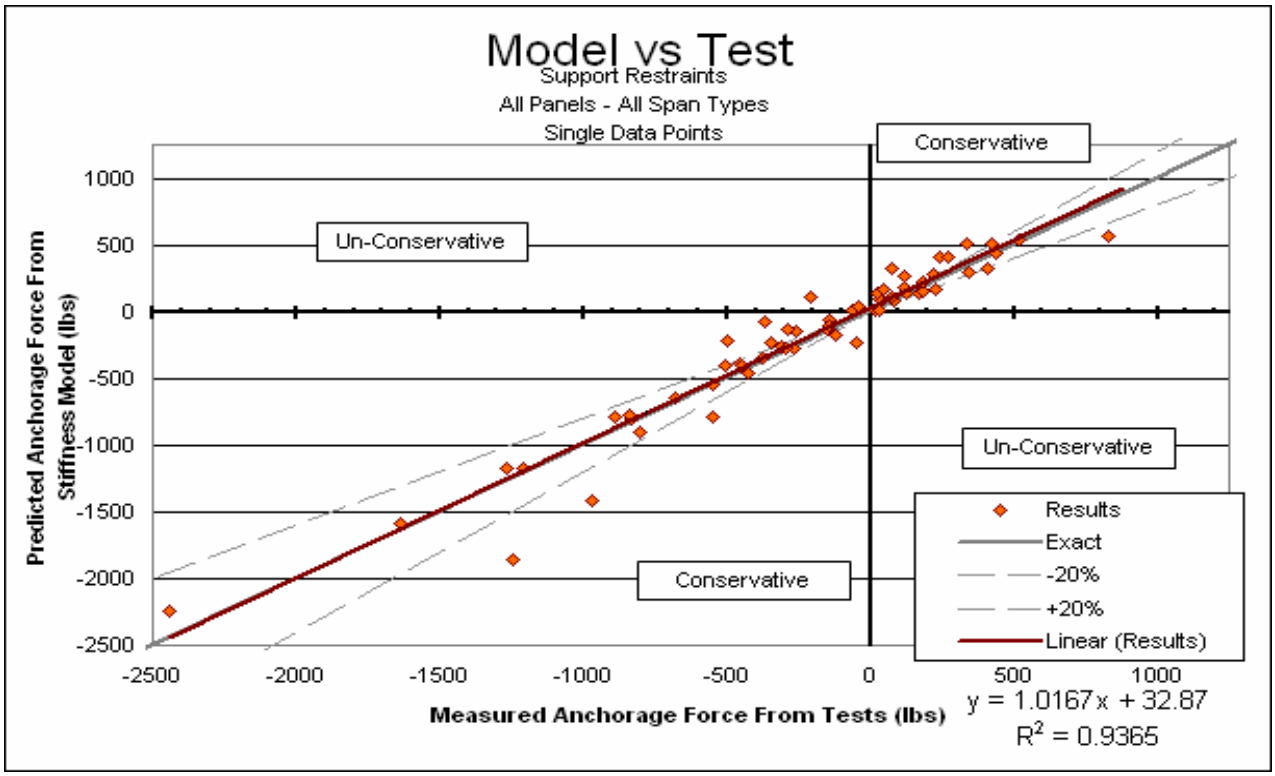
Total Weight: 10460lbs per Bay
Purlin Designation: 10Z0.097
Bracing Configuration: MidPoint

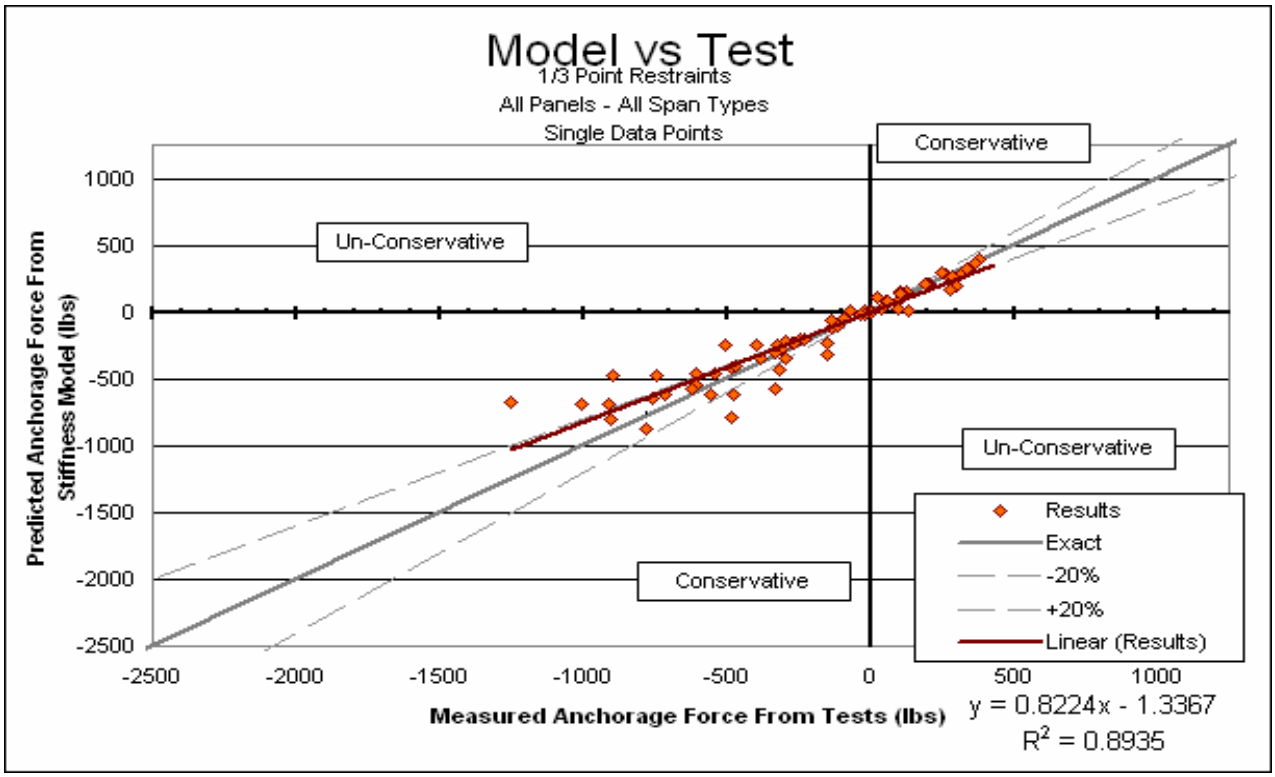
Slope (deg)	Seek & Murray Test	Computer Stiffness Model	AISI 2001 Equation	Proprosed Equations
0.00	330	345	947	253
2.39	45	158	554	128
4.76	-93	-29	162	2
9.46	-311	-307	-614	-134
14.04	-505	-591	-1365	-265
17.48	-647	-803	-1925	-362

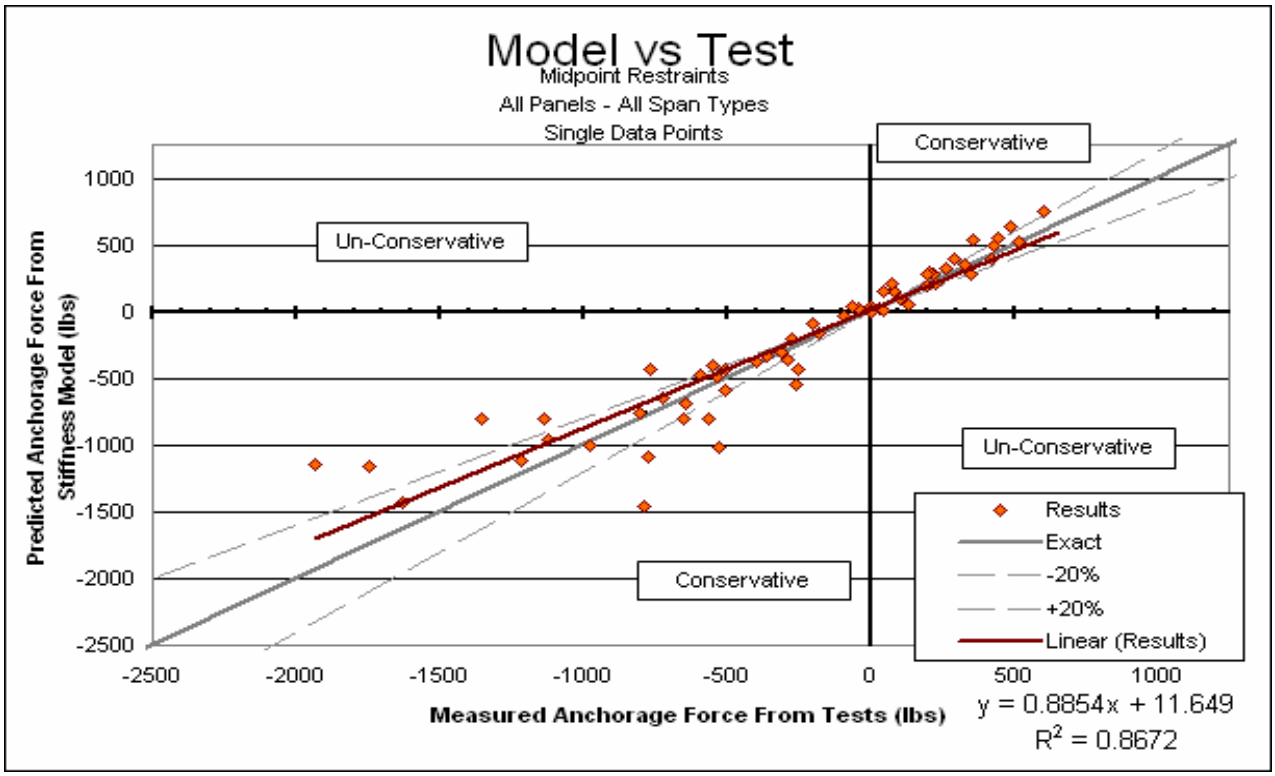


Input Summary:

Ref Node	121112	SupRestraints	--	PanelConnStiff	1500
Index	187	1_3Restraints	--	TribFirst	3.25
Load_	21.35 psf	1_4Restraints	--	TribLast	3.25
RestraintType1	18kpi	MidRestraints	1@1-3	LoadOffset	4.5
RestraintType2	18kpi	ShearStiff	7500	ModelLaps	TRUE
Bays	3@20	PanelArea	0.288	CFactor	0.08333
Purlins	3@Seek7/8	PanelIx	0.12	InactiveTruss	TRUE
Spaces	5@4.5	ClipStiffness	5000	Notes	Seek - Series 8


Model vs Test
Support Restraints
All Panels - All Span Types
Single Data Points
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Anchorage Force From Stiffness Model (lbs)
Measured Anchorage Force From Tests (lbs)
1000
500
0
-500
-1000
-1500
-2000
-2500
-2500
-2000
-1500
-1000
-500
0
500
1000
Results
Exact
-20%
+20%
Linear (Results)
y = 1.0167x + 32.87
R2 = 0.9365


Model vs Test
1/3 Point Restraints
All Panels - All Span Types
Single Data Points
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Anchorage Force From Stiffness Model (lbs)
Measured Anchorage Force From Tests (lbs)
1000
500
0
-500
-1000
-1500
-2000
-2500
-2500
-2000
-1500
-1000
-500
0
500
1000
Results
Exact
-20%
+20%
Linear (Results)
y = 0.8224x - 1.3367
R2 = 0.8935


Model vs Test
Midpoint Restraints
All Panels - All Span Types
Single Data Points
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Anchorage Force From Stiffness Model (lbs)
Measured Anchorage Force From Tests (lbs)
1000
500
0
-500
-1000
-1500
-2000
-2500
-2500
-2000
-1500
-1000
-500
0
500
1000
Results
Exact
-20%
+20%
Linear (Results)
y = 0.8854x + 11.649
R2 = 0.8672

APPENDIX C:
REGRESSION ANALYSIS RESULTS

Support Restraints --- Through Fastened Roof ---Simple Span

Force Coefficients:

[8/24/2006 10:53 "/Graph1" (2453971)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL Statistical

Chi^2/DoF	R^2
37.43516	0.99341

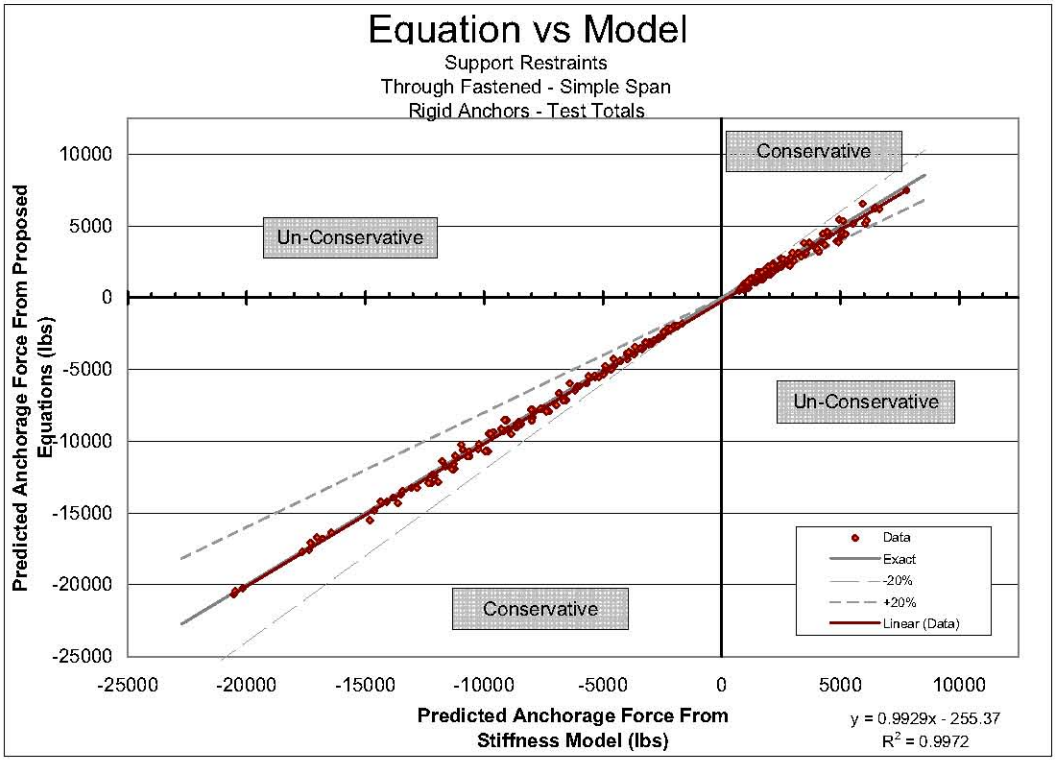
Parameter	Value	Error
C1	0.500	0
C2a	0.00816	2.159E-5
C2b	8.16	0.068
C2c	0.992	4.7E-4

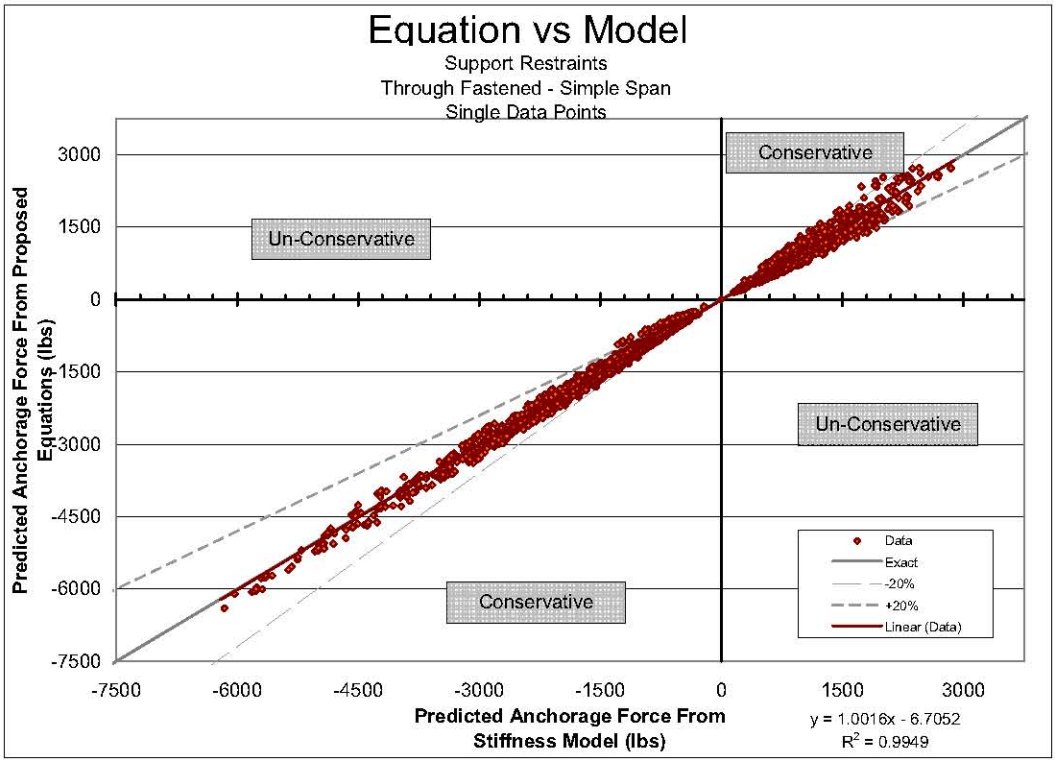
Distribution Coefficients:

[8/24/2006 11:08 "/Graph1" (2453971)]
Data: Data1_PL
Model: PL0808
Weighting:
PL Statistical

Chi^2/DoF	R^2
10.03677	0.99213

Parameter	Value	Error
C1	0.500	0
C2a	0.0082	0
C2b	8.16	0
C2c	0.992	0
C3a	4.27E-4	2.25E-6
C3b	0.167	0.00261


Equation vs Model
Support Restraints
Through Fastened - Simple Span
Rigid Anchors - Test Totals
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Anchorage Force From Proposed Equations (lbs)
Predicted Anchorage Force From Stiffness Model (lbs)
y = 0.9929x - 255.37
R2 = 0.9972


Equation vs Model
Support Restraints
Through Fastened - Simple Span
Single Data Points
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Anchorage Force From Proposed Equations (lbs)
Predicted Anchorage Force From Stiffness Model (lbs)
y = 1.0016x - 6.7052
R2 = 0.9949

Support Restraints --- Standing-Seam Roof ---Simple Span

Force Coefficients:

[8/24/2006 12:38 "/Graph1" (2453971)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL Statistical

Chi^2/DoF	R^2
28.55862	0.99199

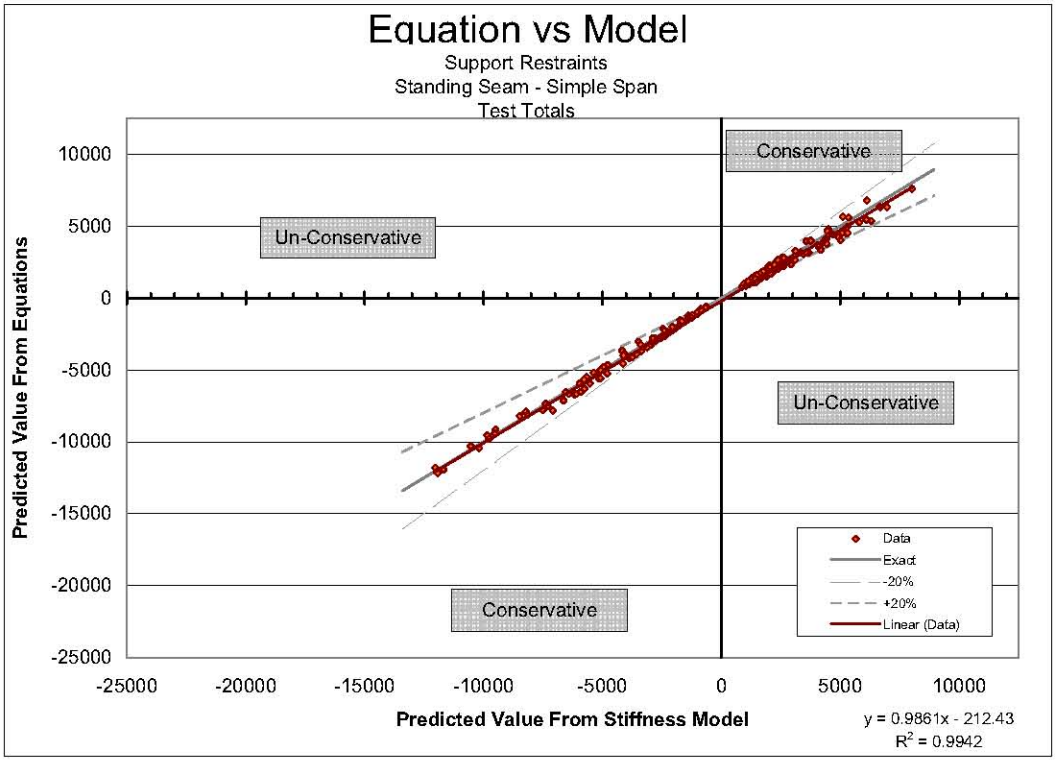
Parameter	Value	Error
C1	0.500	0
C2a	0.00832	1.741E-5
C2b	6.95	0.049
C2c	0.612	3.67E-4

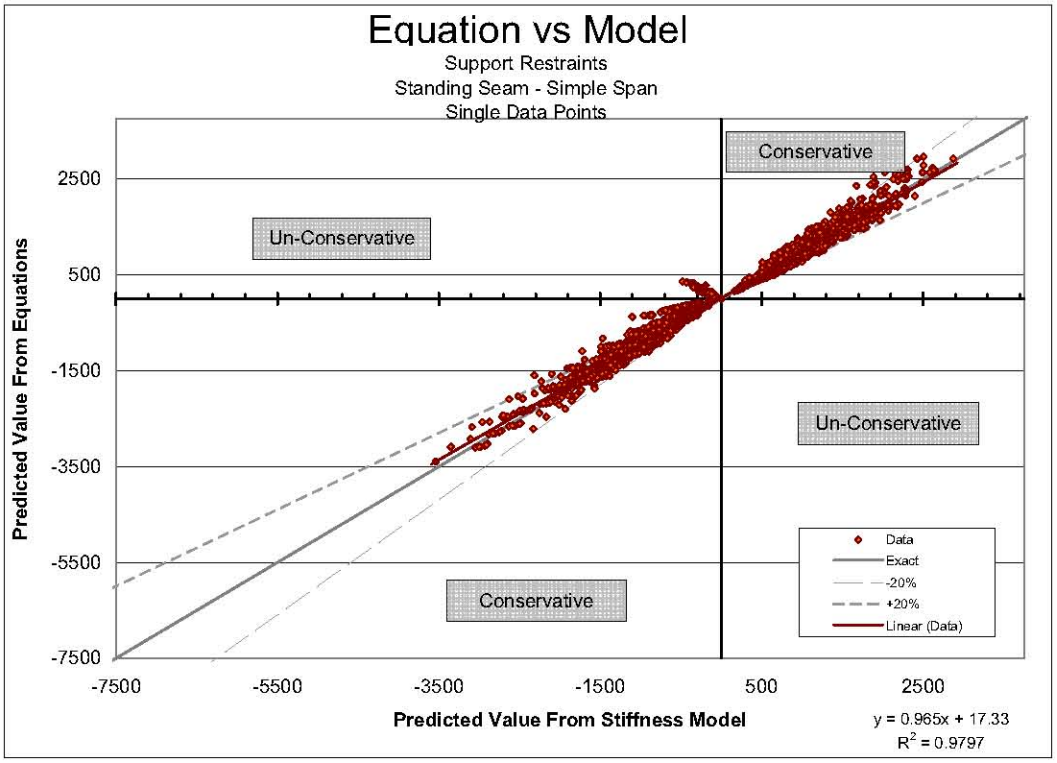
Distribution Coefficients:

[8/24/2006 12:51 "/Graph1" (2453971)]
Data: Data1_PL
Model: PL0808
Weighting:
PL Statistical

Chi^2/DoF	R^2
36.64298	0.95636

Parameter	Value	Error
C1	0.500	0
C2a	0.00832	0
C2b	6.95	0
C2c	0.612	0
C3a	2.89E-4	2.44E-6
C3b	0.051	8.91E-4


Equation vs Model
Support Restraints
Standing Seam - Simple Span
Test Totals
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
10000
5000
0
-5000
-10000
-15000
-20000
-25000
-25000
-20000
-15000
-10000
-5000
0
5000
10000
y = 0.9861x - 212.43
R2 = 0.9942


Equation vs Model
Support Restraints
Standing Seam - Simple Span
Single Data Points
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
2500
500
-1500
-3500
-5500
-7500
-7500
-5500
-3500
-1500
500
2500
y = 0.965x + 17.33
R2 = 0.9797

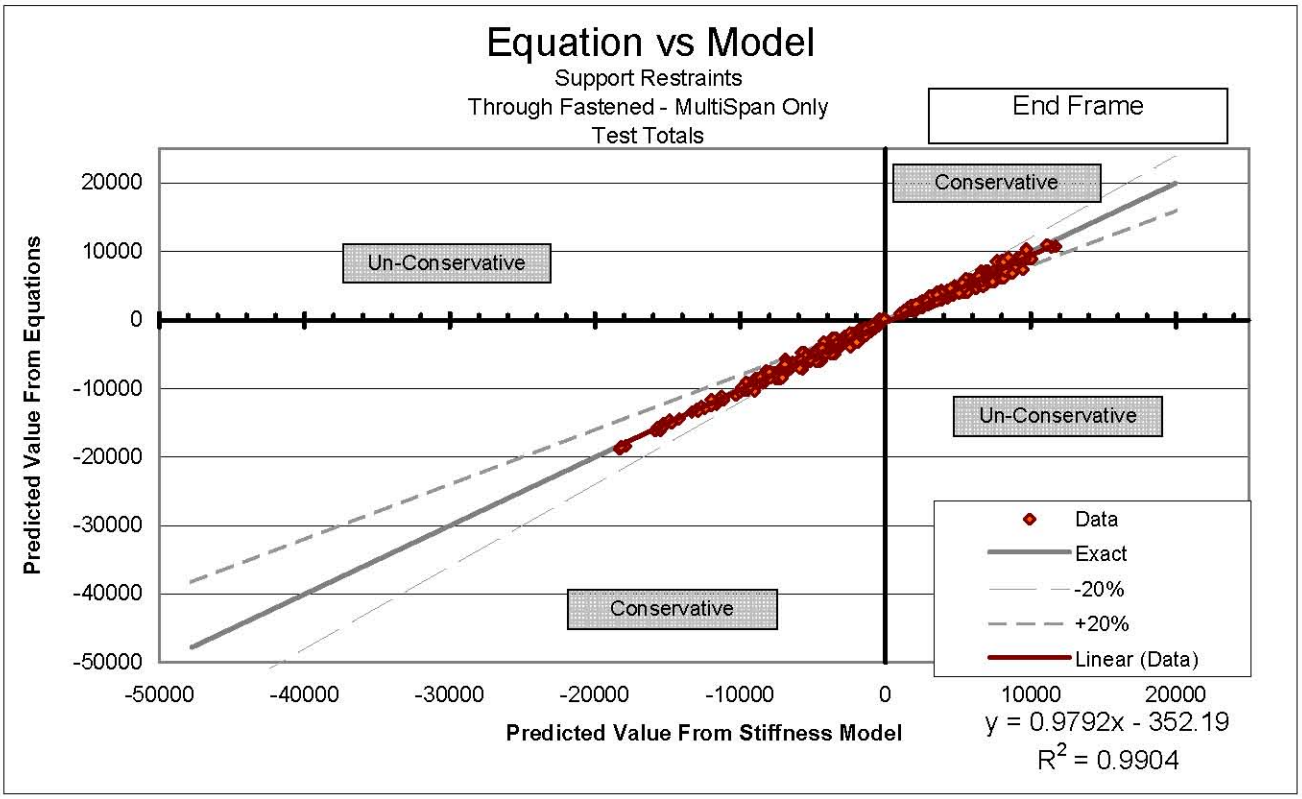
Support Restraints --- Through Fastened Roof ---Multispan, End Frame

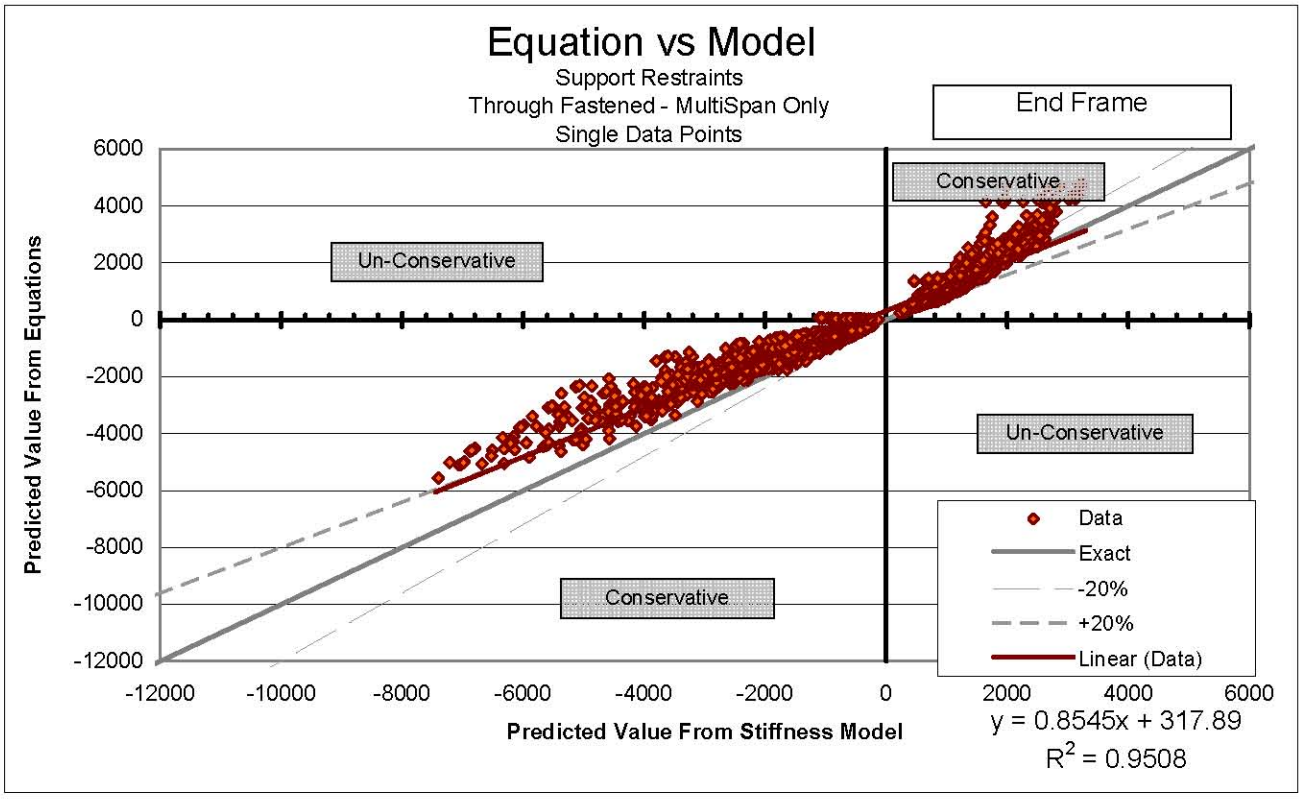
Force Coefficients:

```
[8/28/2006 15:10 "/Graph1" (2453975)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
106.89991       0.98063
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              0.500           0
C2a             0.0144          1.99E-5
C2b             1.72            0.048
C2c             0.943           4.58E-4
----------------------------------------
```

Distribution Coefficients:

```
[8/28/2006 15:45 "/Graph1" (2453975)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
143.81811       0.90226
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              0.500           0
C2a             0.0144          0
C2b             1.72            0
C2c             0.943           0
C3a             7.28E-5         1.15E-6
C3b             0.085           0.00125
----------------------------------------
```


Equation vs Model
Support Restraints
Through Fastened - MultiSpan Only
Test Totals
End Frame
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Value From Equations
Predicted Value From Stiffness Model
20000
10000
0
-10000
-20000
-30000
-40000
-50000
-50000
-40000
-30000
-20000
-10000
0
10000
20000
Data
Exact
-20%
+20%
Linear (Data)
y = 0.9792x - 352.19
R2 = 0.9904


Equation vs Model
Support Restraints
Through Fastened - MultiSpan Only
Single Data Points
End Frame
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Value From Equations
Predicted Value From Stiffness Model
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-12000
-10000
-8000
-6000
-4000
-2000
0
2000
4000
6000
Data
Exact
-20%
+20%
Linear (Data)
y = 0.8545x + 317.89
R2 = 0.9508

Support Restraints --- Through Fastened Roof ---Multispan, First Interior Frame

Force Coefficients:

[8/28/2006 15:23 "/Graph1" (2453975)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL Statistical

Chi^2/DoF	R^2
73.50117	0.99351

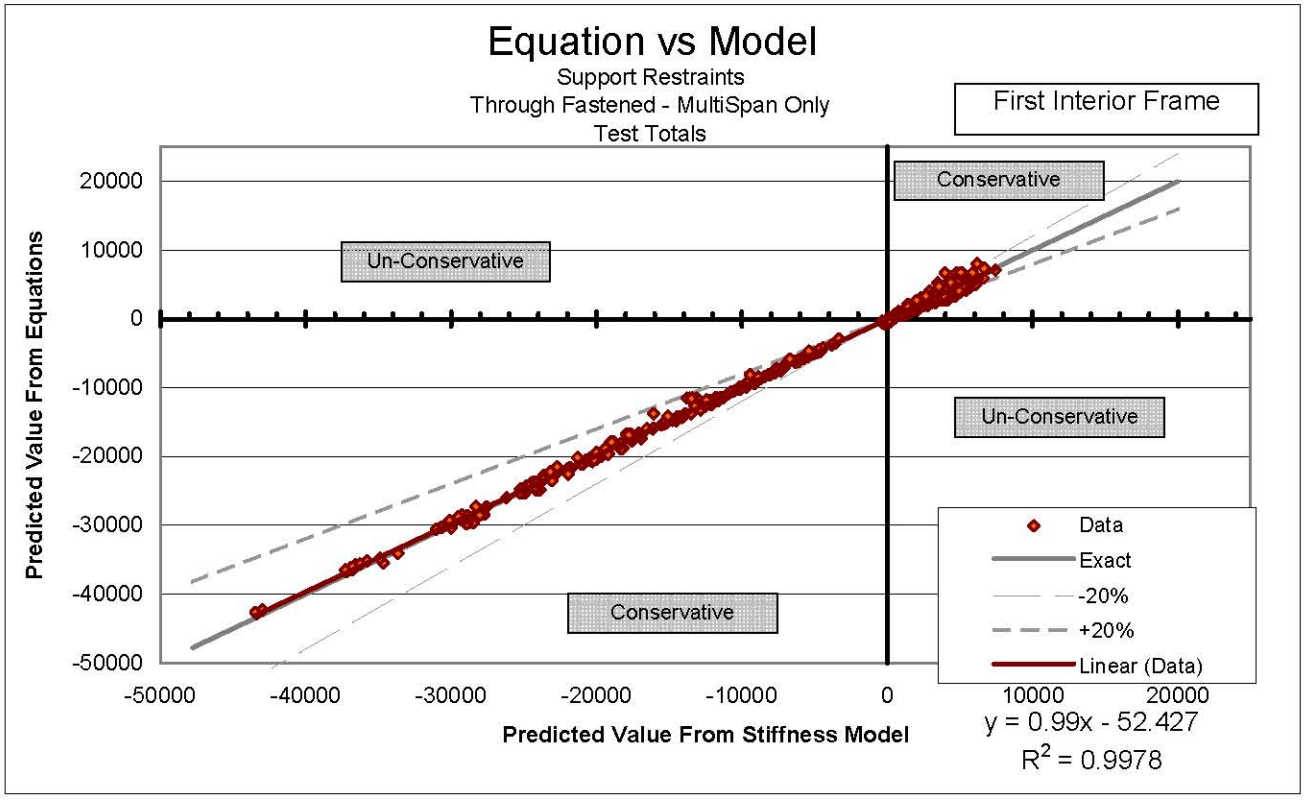
Parameter	Value	Error
C1	1.00	0
C2a	0.0042	1.09E-5
C2b	4.57	0.036
C2c	0.995	3.34E-4

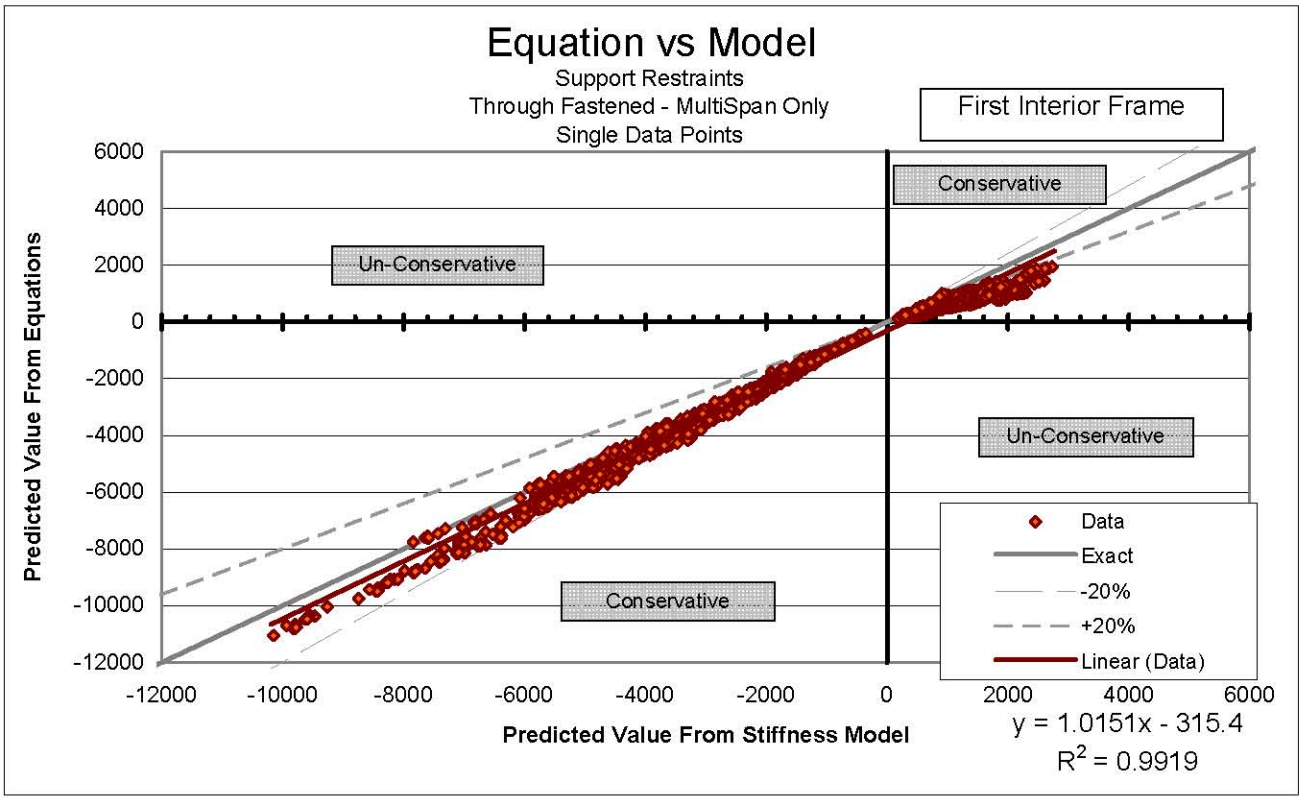
Distribution Coefficients:

[8/28/2006 20:25 "/Graph1" (2453975)]
Data: Data1_PL
Model: PL0808
Weighting:
PL Statistical

Chi^2/DoF	R^2
83.72319	0.95843

Parameter	Value	Error
C1	1.00	0
C2a	0.0042	0
C2b	4.57	0
C2c	0.995	0
C3a	0.00246	4.77E-6
C3b	0.433	0.0069


Equation vs Model
Support Restraints
Through Fastened - MultiSpan Only
Test Totals
First Interior Frame
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Value From Equations
Predicted Value From Stiffness Model
20000
10000
0
-10000
-20000
-30000
-40000
-50000
-50000
-40000
-30000
-20000
-10000
0
10000
20000
Data
Exact
-20%
+20%
Linear (Data)
y = 0.99x - 52.427
R2 = 0.9978


Equation vs Model
Support Restraints
Through Fastened - MultiSpan Only
Single Data Points
First Interior Frame
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Value From Equations
Predicted Value From Stiffness Model
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-12000
-10000
-8000
-6000
-4000
-2000
0
2000
4000
6000
Data
Exact
-20%
+20%
Linear (Data)
y = 1.0151x - 315.4
R2 = 0.9919

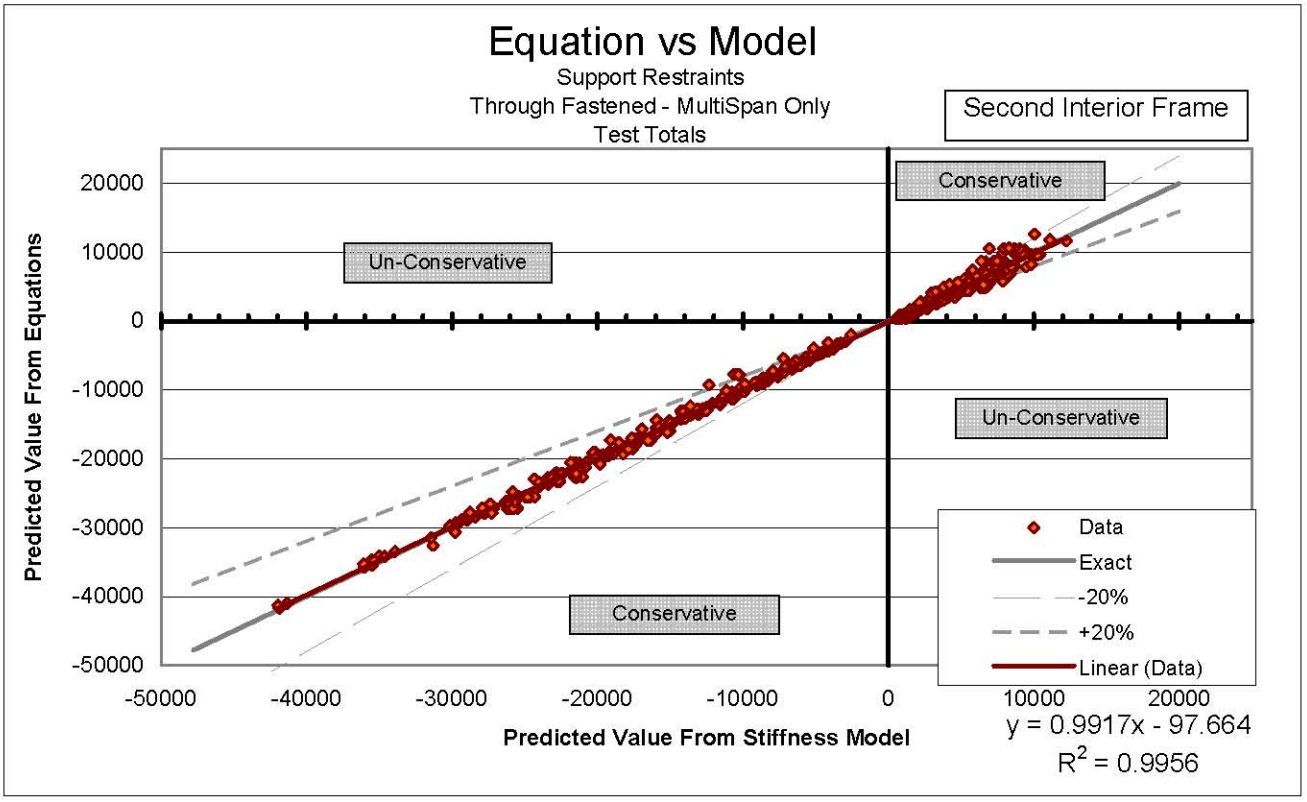
Support Restraints --- Through Fastened Roof ---Multispan, Typical Interior Frame

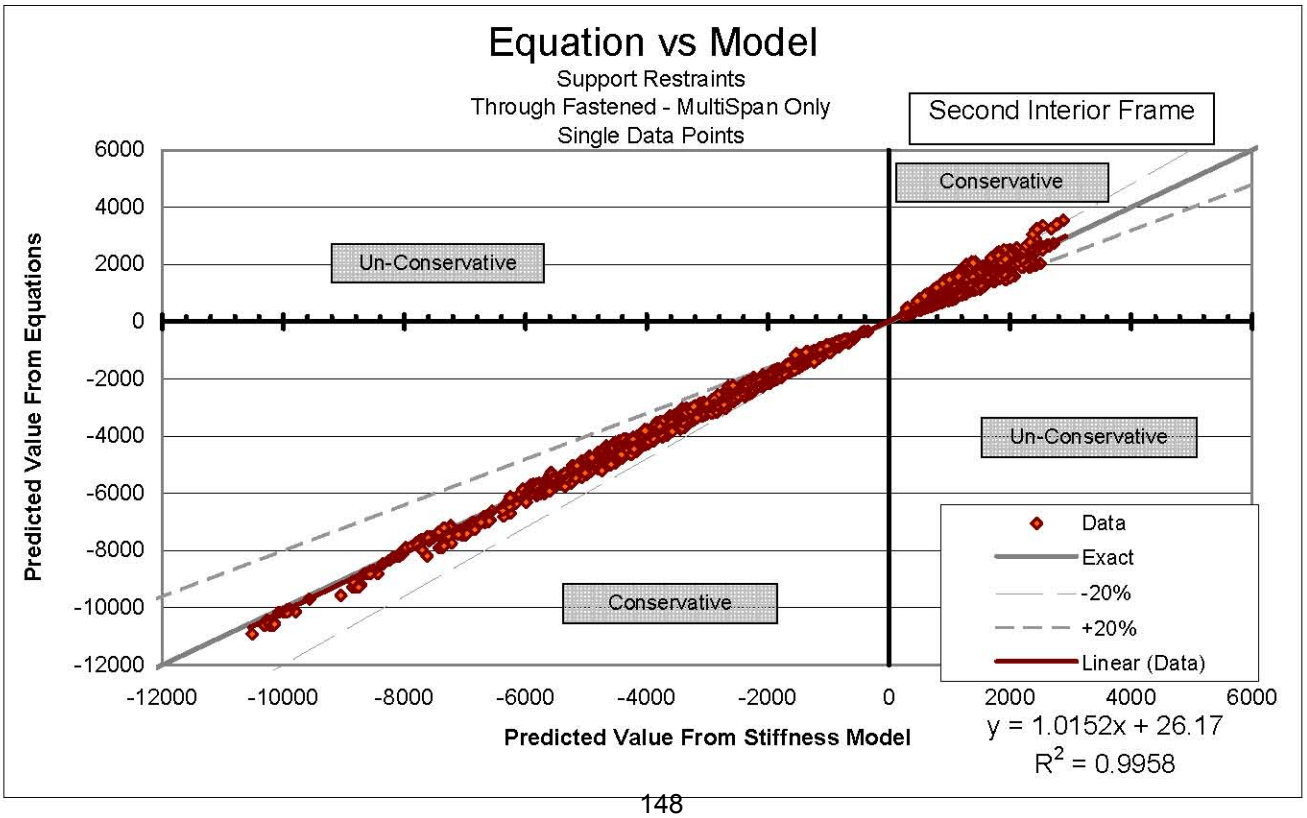
Force Coefficients:

```
[8/28/2006 15:22 "/Graph1" (2453975)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
84.59427        0.99251
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.0068          1.41E-5
C2b             5.67            0.045
C2c             0.988           3.33E-4
----------------------------------------
```

Distribution Coefficients:

```
[8/28/2006 20:45 "/Graph1" (2453975)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
17.16313        0.99186
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.0068          0
C2b             5.67            0
C2c             0.988           0
C3a             0.00183         3.84E-6
C3b             0.359           0.0052
----------------------------------------
```


Equation vs Model
Support Restraints
Through Fastened - MultiSpan Only
Test Totals
Second Interior Frame
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Value From Equations
Predicted Value From Stiffness Model
20000
10000
0
-10000
-20000
-30000
-40000
-50000
-50000
-40000
-30000
-20000
-10000
0
10000
20000
Data
Exact
-20%
+20%
Linear (Data)
y = 0.9917x - 97.664
R2 = 0.9956


Equation vs Model
Support Restraints
Through Fastened - MultiSpan Only
Single Data Points
Second Interior Frame
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Value From Equations
Predicted Value From Stiffness Model
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-12000
-10000
-8000
-6000
-4000
-2000
0
2000
4000
6000
Data
Exact
-20%
+20%
Linear (Data)
y = 1.0152x + 26.17
R2 = 0.9958

Support Restraints --- Standing-Seam Roof ---Multispan, End Frame

Force Coefficients:

[8/30/2006 13:11 "/Graph1" (2453977)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL Statistical

Chi^2/DoF	R^2
266.63683	0.91221

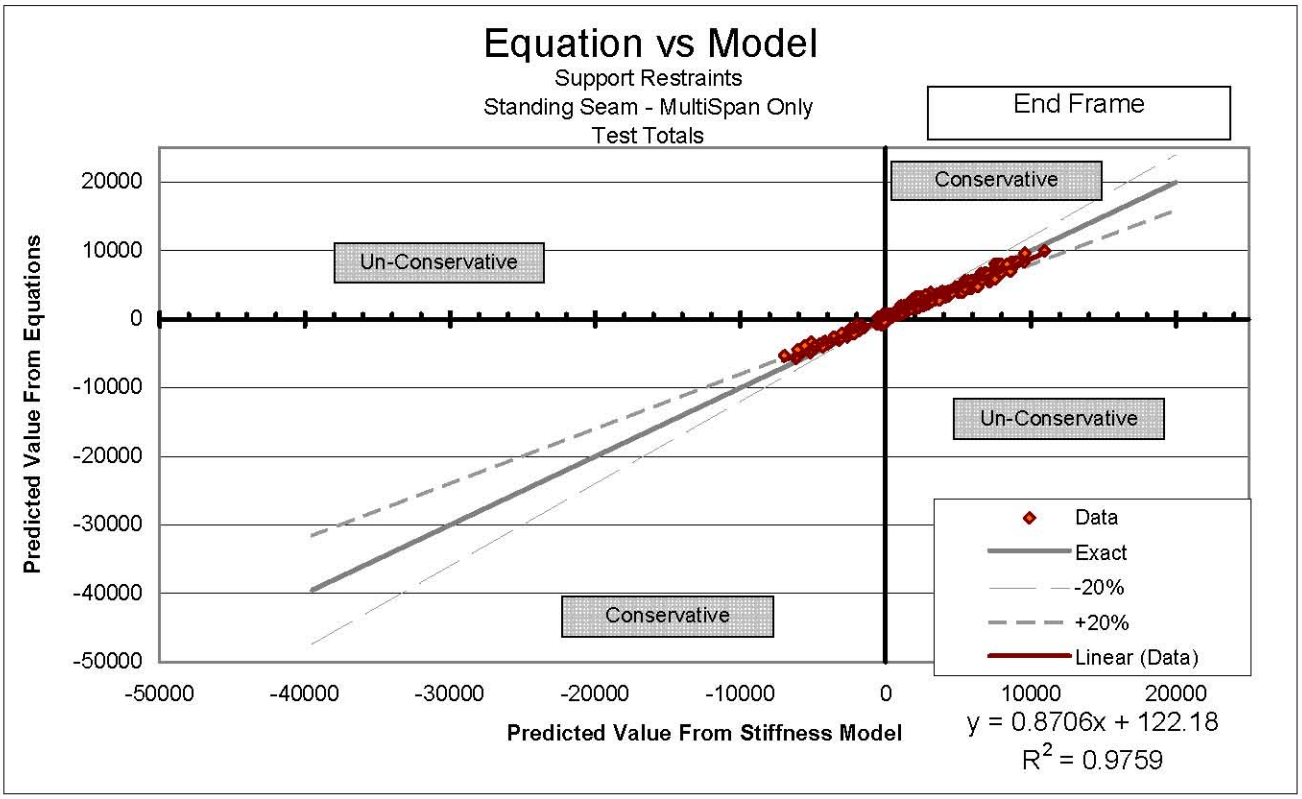
Parameter	Value	Error
C1	0.500	0
C2a	0.0127	1.4E-5
C2b	2.71	0.036
C2c	0.349	2.8E-4

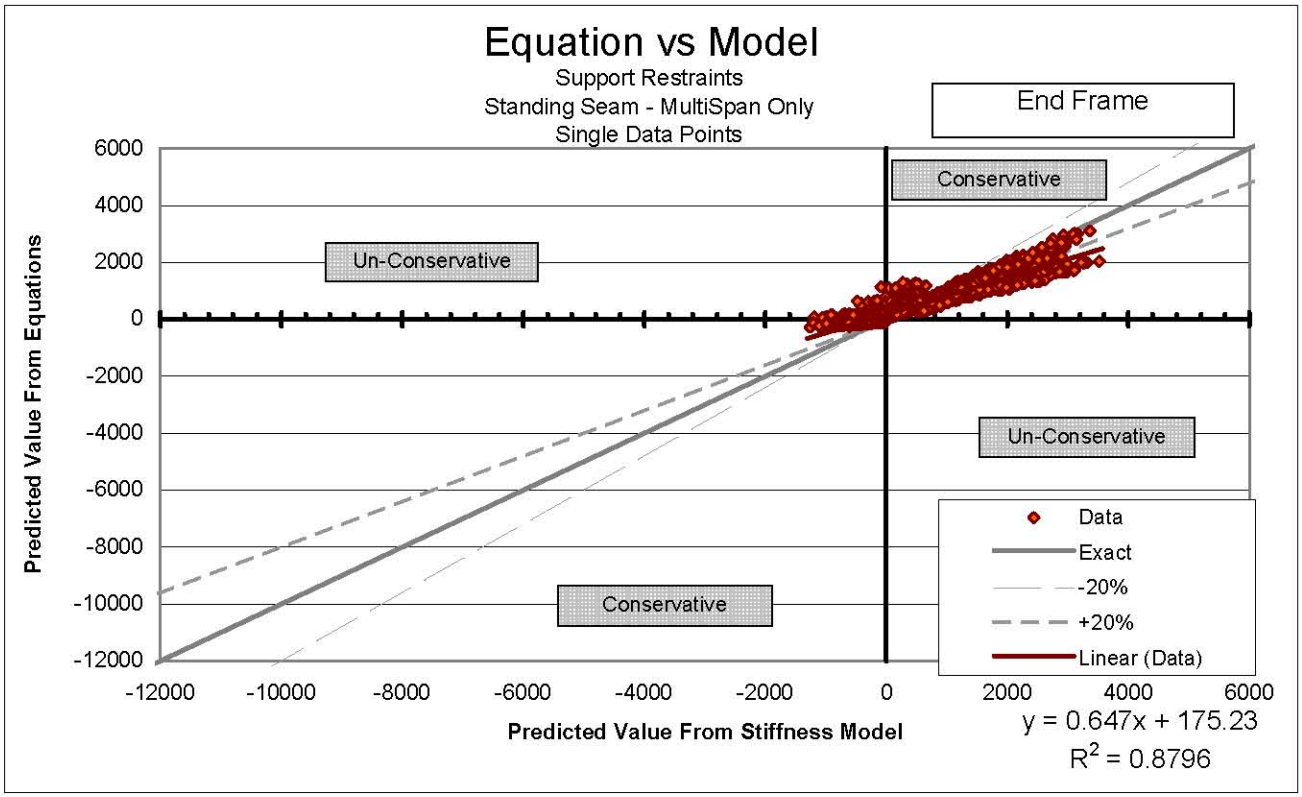
Distribution Coefficients:

[8/30/2006 13:40 "/Graph1" (2453977)]
Data: Data1_PL
Model: PL0808
Weighting:
PL Statistical

Chi^2/DoF	R^2
185.74721	0.71894

Parameter	Value	Error
C1	0.500	0
C2a	0.0127	0
C2b	2.71	0
C2c	0.349	0
C3a	0.00242	9.24E-6
C3b	0.246	0.0061


Equation vs Model
Support Restraints
Standing Seam - MultiSpan Only
Test Totals
End Frame
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
20000
10000
0
-10000
-20000
-30000
-40000
-50000
-50000
-40000
-30000
-20000
-10000
0
10000
20000
y = 0.8706x + 122.18
R2 = 0.9759


Equation vs Model
Support Restraints
Standing Seam - MultiSpan Only
Single Data Points
End Frame
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-12000
-10000
-8000
-6000
-4000
-2000
0
2000
4000
6000
y = 0.647x + 175.23
R2 = 0.8796

Support Restraints --- Standing-Seam Roof ---Multispan, First Interior Frame

Force Coefficients:

[8/30/2006 13:14 "/Graph1" (2453977)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL Statistical

Chi^2/DoF	R^2
53.25402	0.9943

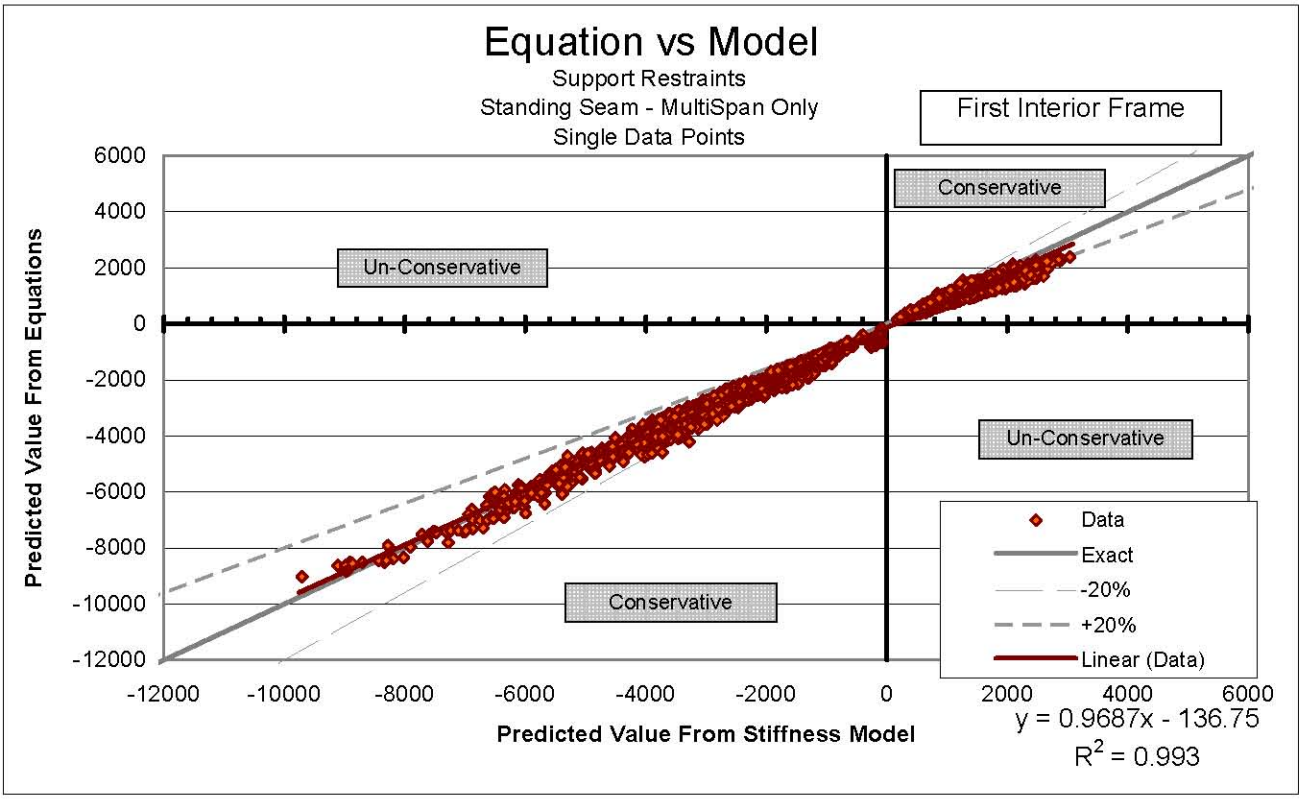
Parameter	Value	Error
C1	1.00	0
C2a	0.00171	1.49E-5
C2b	17.3	0.054
C2c	0.775	3.29E-4

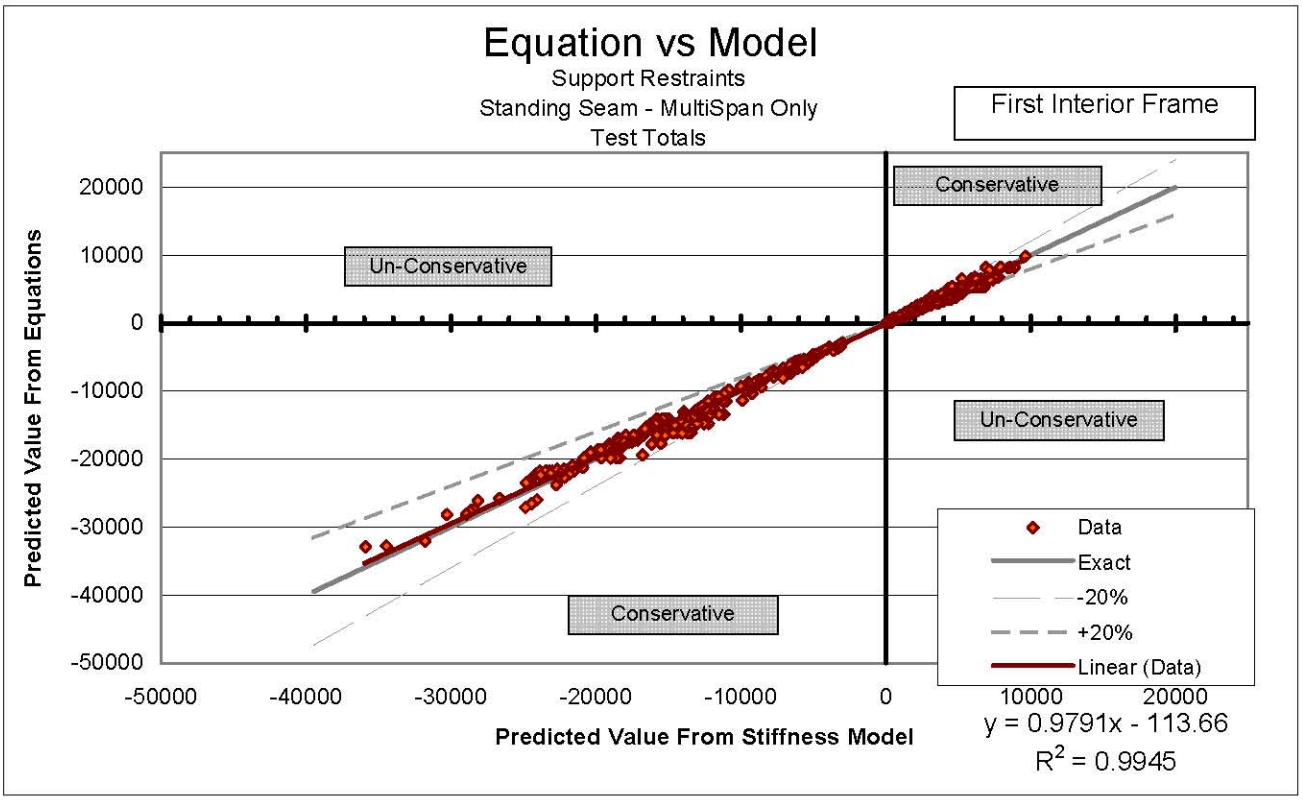
Distribution Coefficients:

[8/30/2006 14:32 "/Graph1" (2453977)]
Data: Data1_PL
Model: PL0808
Weighting:
PL Statistical

Chi^2/DoF	R^2
34.4799	0.97997

Parameter	Value	Error
C1	1.00	0
C2a	0.00171	0
C2b	17.3	0
C2c	0.775	0
C3a	0.00159	4.31E-6
C3b	0.135	0.00161


Equation vs Model
Support Restraints
Standing Seam - MultiSpan Only
Single Data Points
First Interior Frame
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Value From Equations
Predicted Value From Stiffness Model
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-12000
-10000
-8000
-6000
-4000
-2000
0
2000
4000
6000
Data
Exact
-20%
+20%
Linear (Data)
y = 0.9687x - 136.75
R2 = 0.993


Equation vs Model
Support Restraints
Standing Seam - MultiSpan Only
Test Totals
First Interior Frame
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Value From Equations
Predicted Value From Stiffness Model
20000
10000
0
-10000
-20000
-30000
-40000
-50000
-50000
-40000
-30000
-20000
-10000
0
10000
20000
Data
Exact
-20%
+20%
Linear (Data)
y = 0.9791x - 113.66
R2 = 0.9945

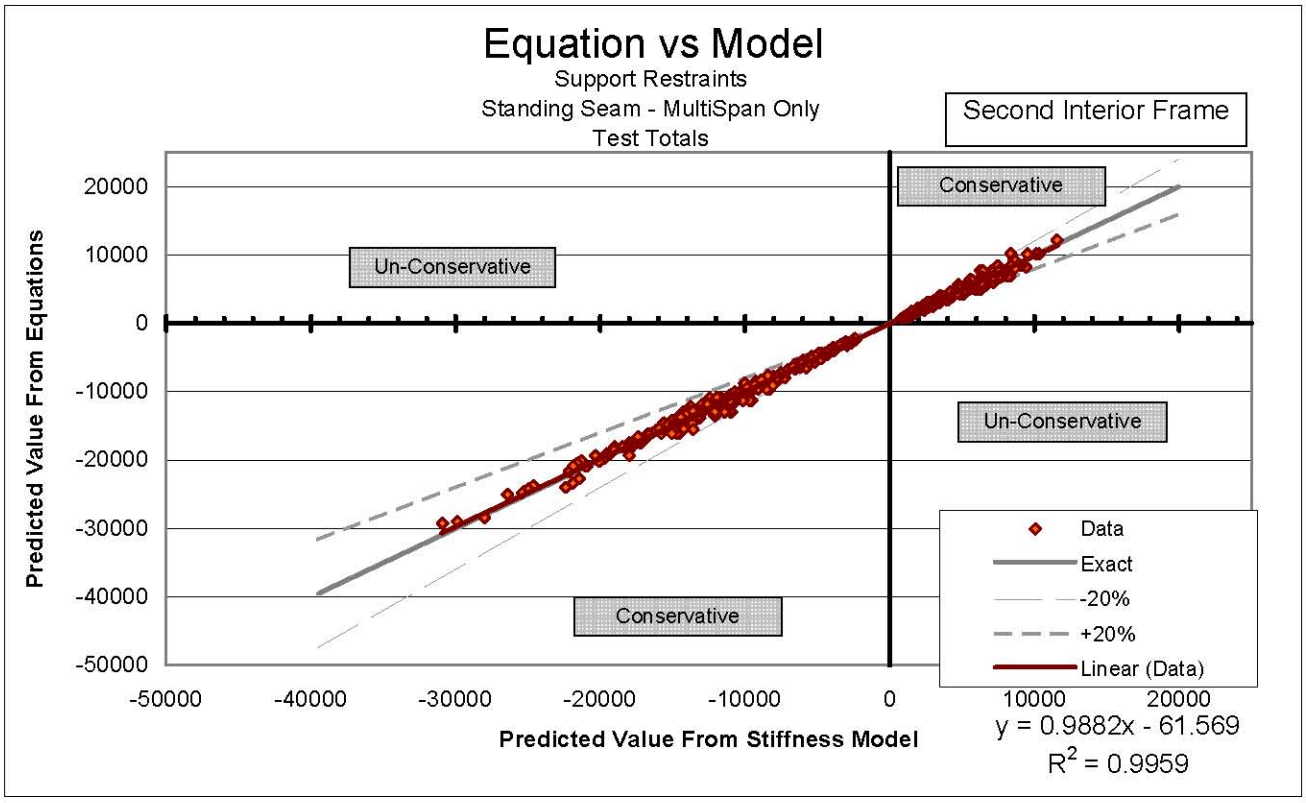
Support Restraints --- Standing-Seam Roof ---Multispan, Typical Interior Frame

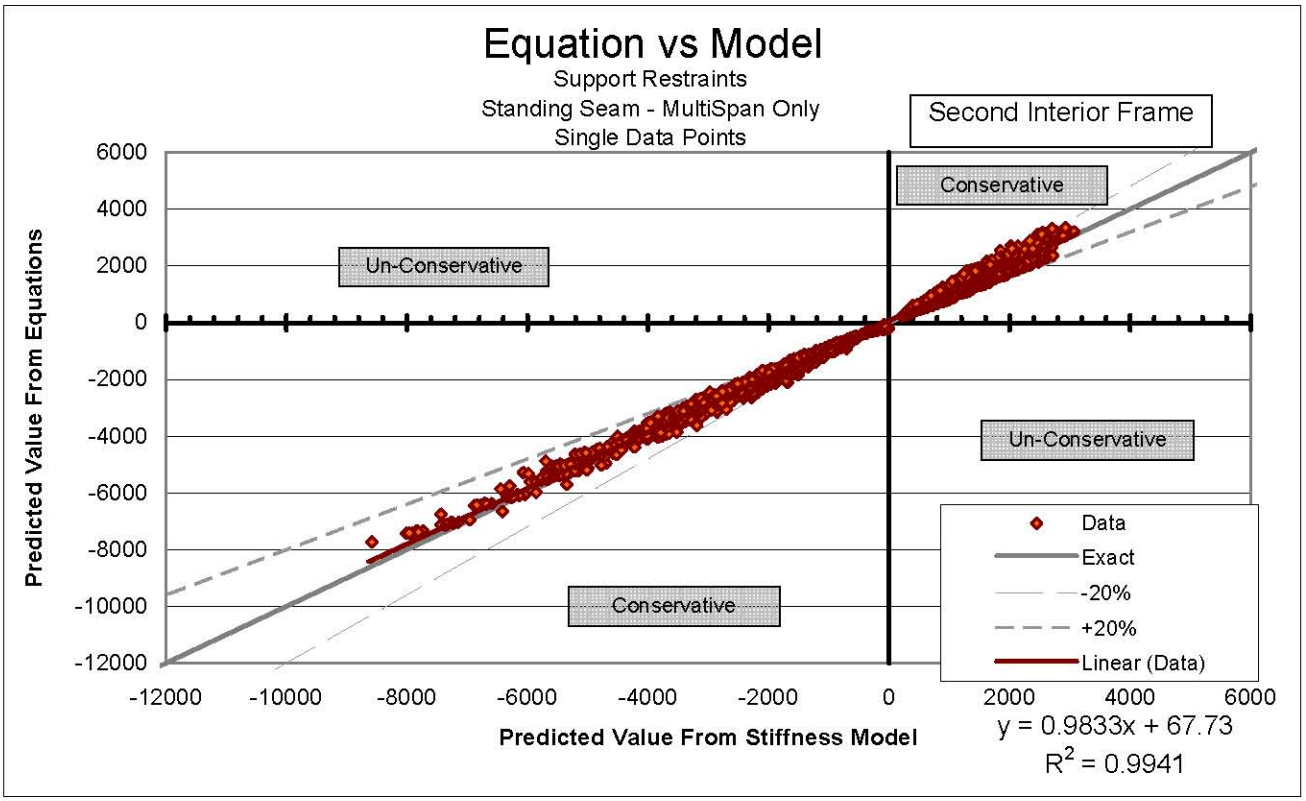
Force Coefficients:

```
[8/30/2006 13:17 "/Graph1" (2453977)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
42.305          0.99503
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.0043          1.69E-5
C2b             13.8            0.059
C2c             0.705           3.13E-4
----------------------------------------
```

Distribution Coefficients:

```
[8/30/2006 15:00 "/Graph1" (2453977)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
17.44304        0.98914
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.0043          0
C2b             13.8            0
C2c             0.705           0
C3a             0.00136         3.84E-6
C3b             0.170           0.00235
----------------------------------------
```


Equation vs Model
Support Restraints
Standing Seam - MultiSpan Only
Test Totals
Second Interior Frame
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Value From Equations
Predicted Value From Stiffness Model
Data
Exact
-20%
+20%
Linear (Data)
y = 0.9882x - 61.569
R2 = 0.9959


Equation vs Model
Support Restraints
Standing Seam - MultiSpan Only
Single Data Points
Second Interior Frame
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Value From Equations
Predicted Value From Stiffness Model
Data
Exact
-20%
+20%
Linear (Data)
y = 0.9833x + 67.73
R2 = 0.9941

Third-Point Restraints --- Through Fastened Roof ---Simple Span

Force Coefficients:

[9/16/2006 15:27 "/Graph1" (2453994)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL Statistical

Chi^2/DoF	R^2
51.50441	0.99082

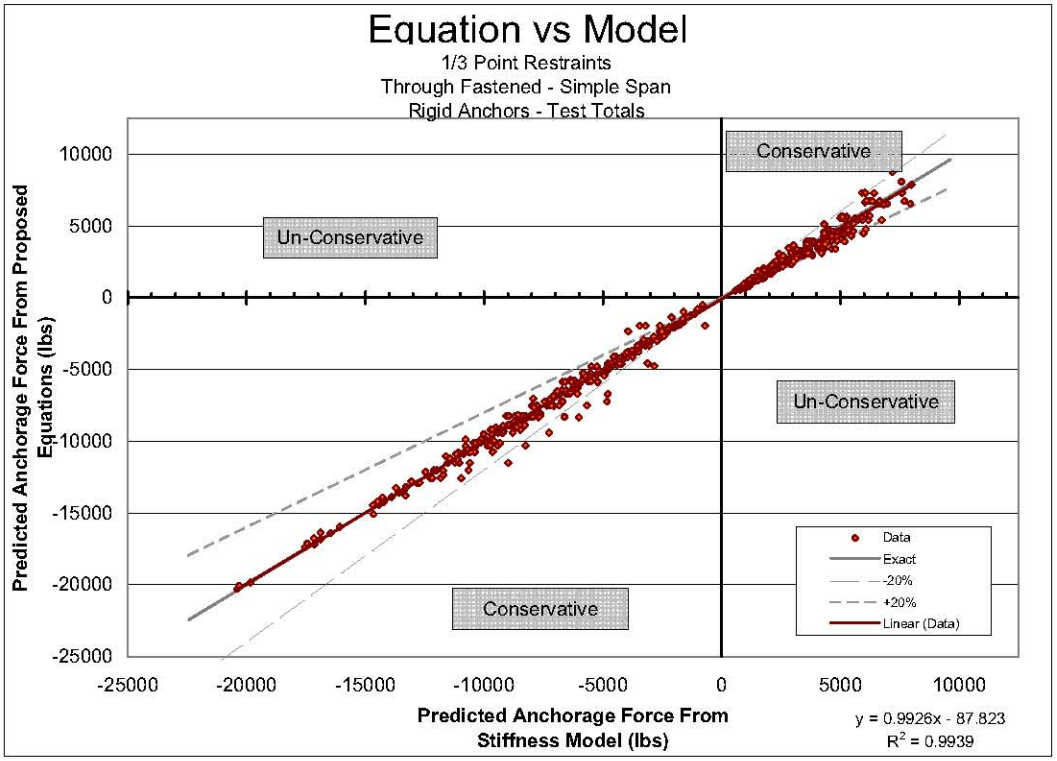
Parameter	Value	Error
C1	0.500	0
C2a	0.00783	2.138E-5
C2b	10.6	0.067
C2c	0.976	4.66E-4

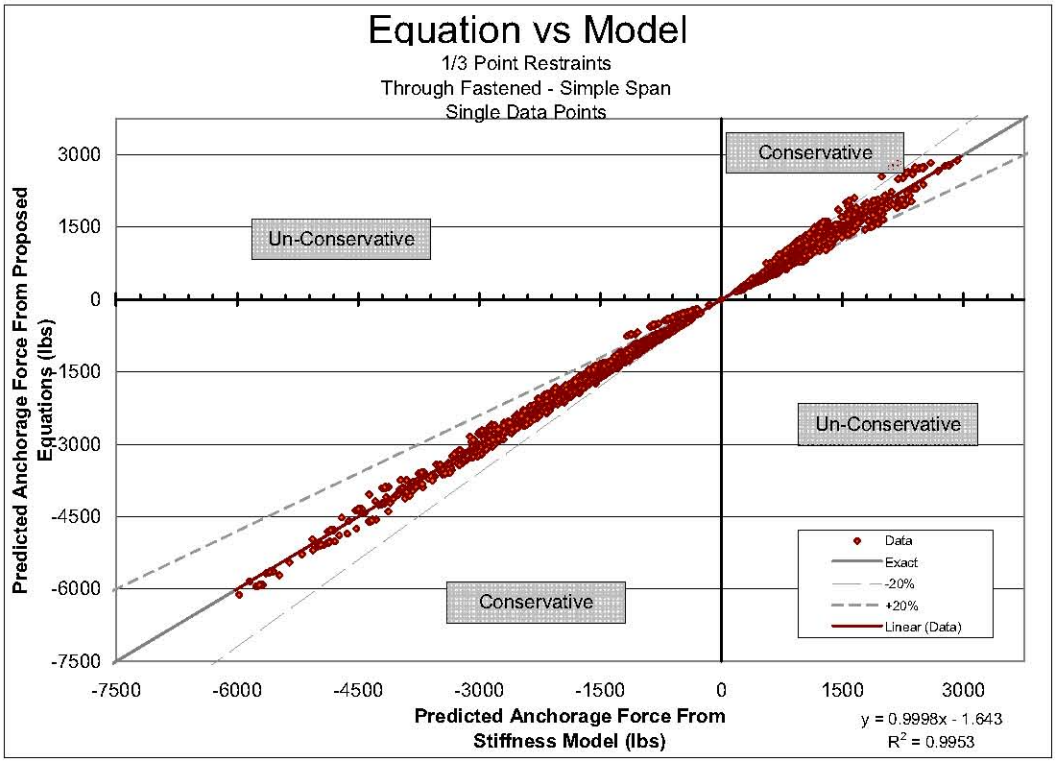
Distribution Coefficients:

[9/24/2006 22:02 "/Graph1" (2454002)]
Data: Data1_PL
Model: PL0808
Weighting:
PL Statistical

Chi^2/DoF	R^2
9.21762	0.99275

Parameter	Value	Error
C1	0.500	0
C2a	0.00783	0
C2b	10.6	0
C2c	0.976	0
C3a	3.94E-4	2.17E-6
C3b	0.401	0.0091


Equation vs Model
1/3 Point Restraints
Through Fastened - Simple Span
Rigid Anchors - Test Totals
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Anchorage Force From Proposed Equations (lbs)
Predicted Anchorage Force From Stiffness Model (lbs)
y = 0.9926x - 87.823
R2 = 0.9939


Equation vs Model
1/3 Point Restraints
Through Fastened - Simple Span
Single Data Points
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Anchorage Force From Proposed Equations (lbs)
Predicted Anchorage Force From Stiffness Model (lbs)
y = 0.9998x - 1.643
R2 = 0.9953

Third-Point Restraints --- Standing-Seam Roof ---Simple Span

Force Coefficients:

[9/17/2006 15:23 "/Graph1" (2453995)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL Statistical

Chi^2/DoF	R^2
21.55576	0.99484

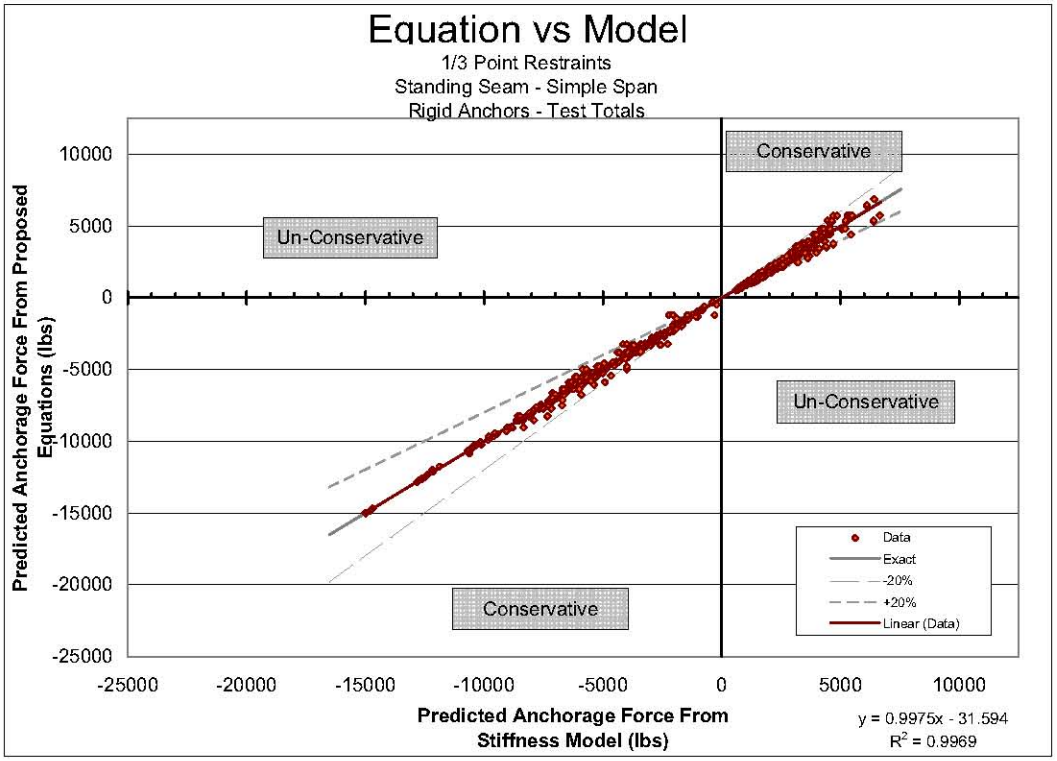
Parameter	Value	Error
C1	0.500	0
C2a	0.00733	1.867E-5
C2b	5.35	0.056
C2c	0.729	4.03E-4

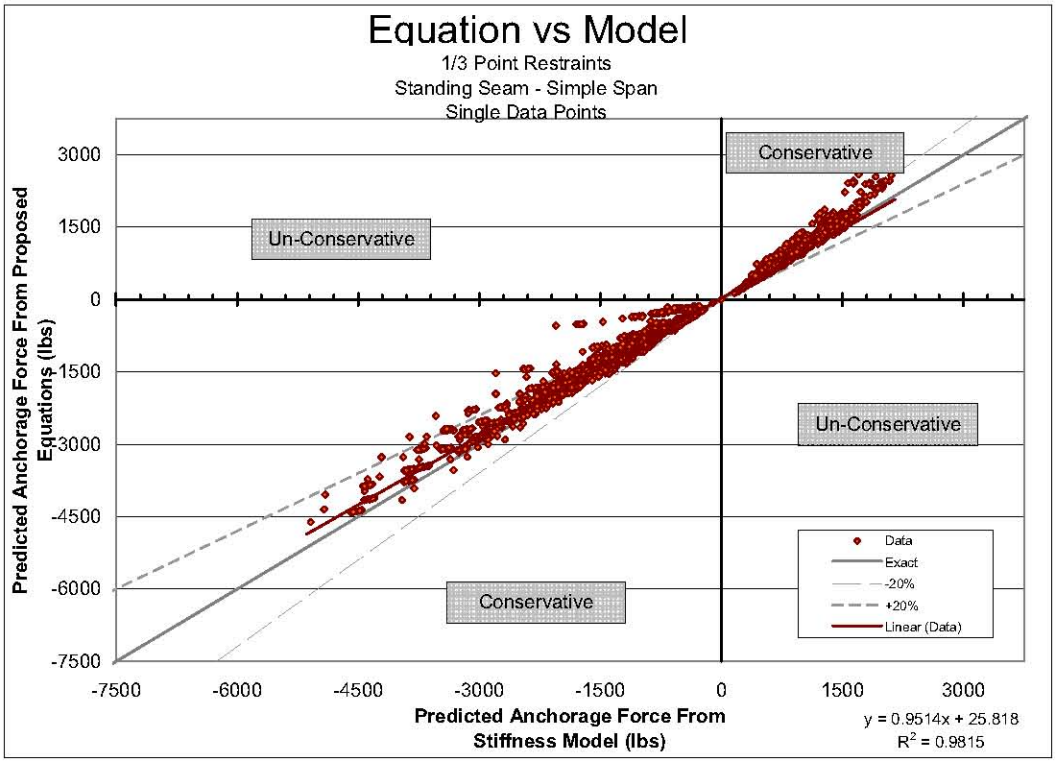
Distribution Coefficients:

[9/24/2006 22:15 "/Graph1" (2454002)]
Data: Data1_PL
Model: PL0808
Weighting:
PL Statistical

Chi^2/DoF	R^2
25.14402	0.97496

Parameter	Value	Error
C1	0.500	0
C2a	0.00733	0
C2b	5.35	0
C2c	0.729	0
C3a	1.87E-4	1.97E-6
C3b	0.178	0.0036


Equation vs Model
1/3 Point Restraints
Standing Seam - Simple Span
Rigid Anchors - Test Totals
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Anchorage Force From Proposed Equations (lbs)
Predicted Anchorage Force From Stiffness Model (lbs)
y = 0.9975x - 31.594
R2 = 0.9969


Equation vs Model
1/3 Point Restraints
Standing Seam - Simple Span
Single Data Points
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Anchorage Force From Proposed Equations (lbs)
Predicted Anchorage Force From Stiffness Model (lbs)
y = 0.9514x + 25.818
R2 = 0.9815

Third-Point Restraints --- Through Fastened Roof ---Multispan, End Bay, Exterior Anchor

Force Coefficients:

[9/25/2006 14:12 "/Graph1" (2454003)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL Statistical

Chi^2/DoF	R^2
114.14852	0.98042

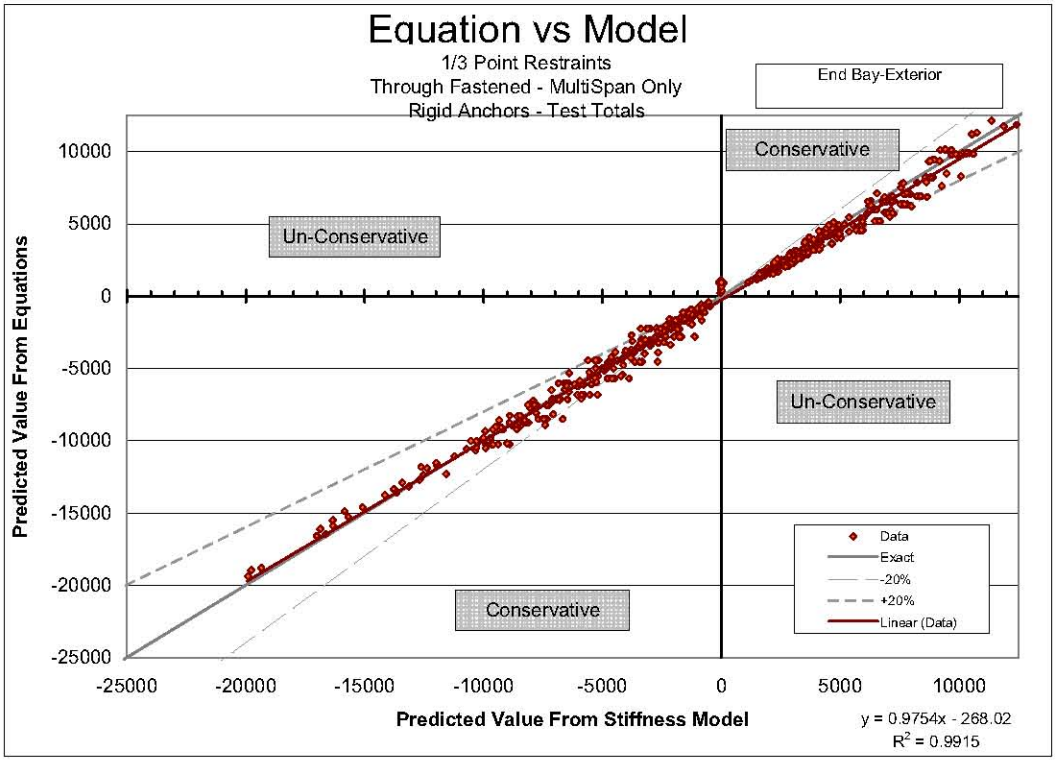
Parameter	Value	Error
C1	0.500	0
C2a	0.01523	2.169E-5
C2b	4.36	0.058
C2c	0.978	4.65E-4

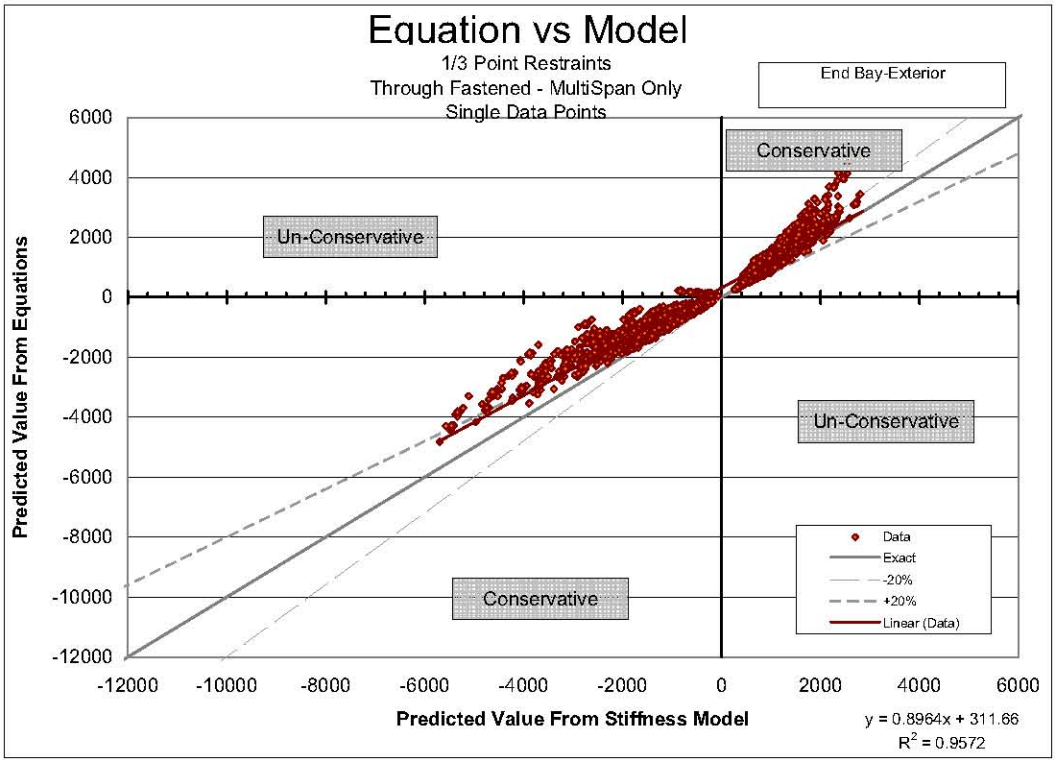
Distribution Coefficients:

[9/25/2006 14:18 "/Graph1" (2454003)]
Data: Data1_PL
Model: PL0808
Weighting:
PL Statistical

Chi^2/DoF	R^2
266.30641	0.87384

Parameter	Value	Error
C1	0.500	0
C2a	0.01520	0
C2b	4.36	0
C2c	0.978	0
C3a	7.24E-4	2.55E-5
C3b	0.043	0.0035


Equation vs Model
1/3 Point Restraints
Through Fastened - MultiSpan Only
Rigid Anchors - Test Totals
End Bay-Exterior
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
y = 0.9754x - 268.02
R2 = 0.9915


Equation vs Model
1/3 Point Restraints
Through Fastened - MultiSpan Only
Single Data Points
End Bay-Exterior
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
y = 0.8964x + 311.66
R2 = 0.9572

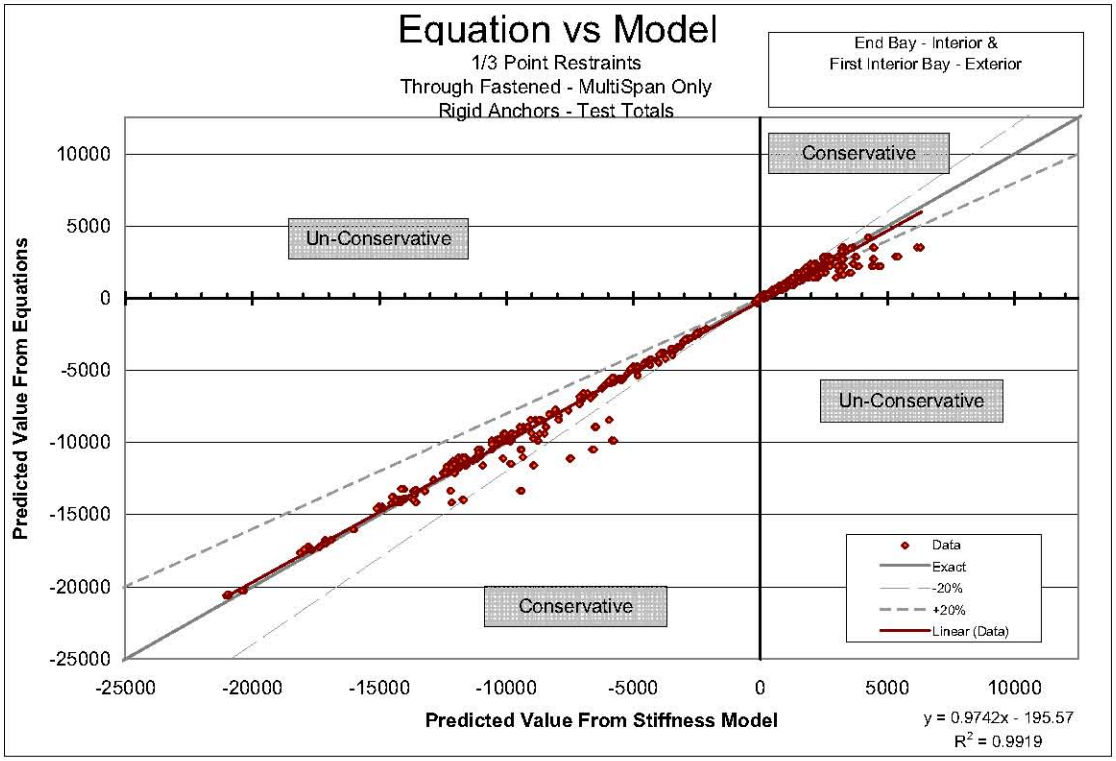
Third-Point Restraints --- Through Fastened Roof ---Multispan, End Bay, Interior Anchor

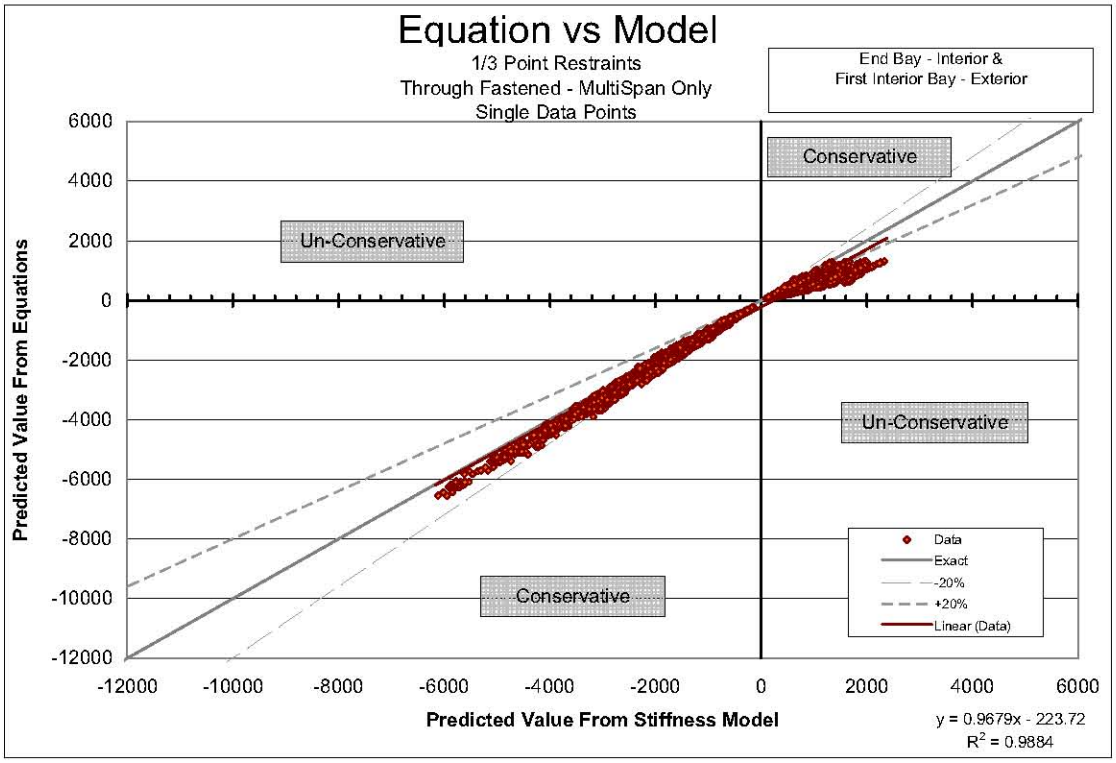
Force Coefficients:

```
[9/25/2006 14:29 "/Graph1" (2454003)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
80.83748        0.98528
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              0.500           0
C2a             0.002434        1.137E-5
C2b             12.6            0.038
C2c             0.957           3.28E-4
----------------------------------------
```

Distribution Coefficients:

```
[9/25/2006 14:37 "/Graph1" (2454003)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
117.72588       0.9411
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              0.500           0
C2a             0.002430        0
C2b             12.6            0
C2c             0.957           0
C3a             8.19E-4         1.55E-5
C3b             0.200           0.0240
----------------------------------------
```


Equation vs Model
1/3 Point Restraints
Through Fastened - MultiSpan Only
Rigid Anchors - Test Totals
End Bay - Interior &
First Interior Bay - Exterior
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
y = 0.9742x - 195.57
R2 = 0.9919
10000
5000
0
-5000
-10000
-15000
-20000
-25000
-25000
-20000
-15000
-10000
-5000
0
5000
10000


Equation vs Model
1/3 Point Restraints
Through Fastened - MultiSpan Only
Single Data Points
End Bay - Interior &
First Interior Bay - Exterior
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
y = 0.9679x - 223.72
R2 = 0.9884
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-12000
-10000
-8000
-6000
-4000
-2000
0
2000
4000
6000

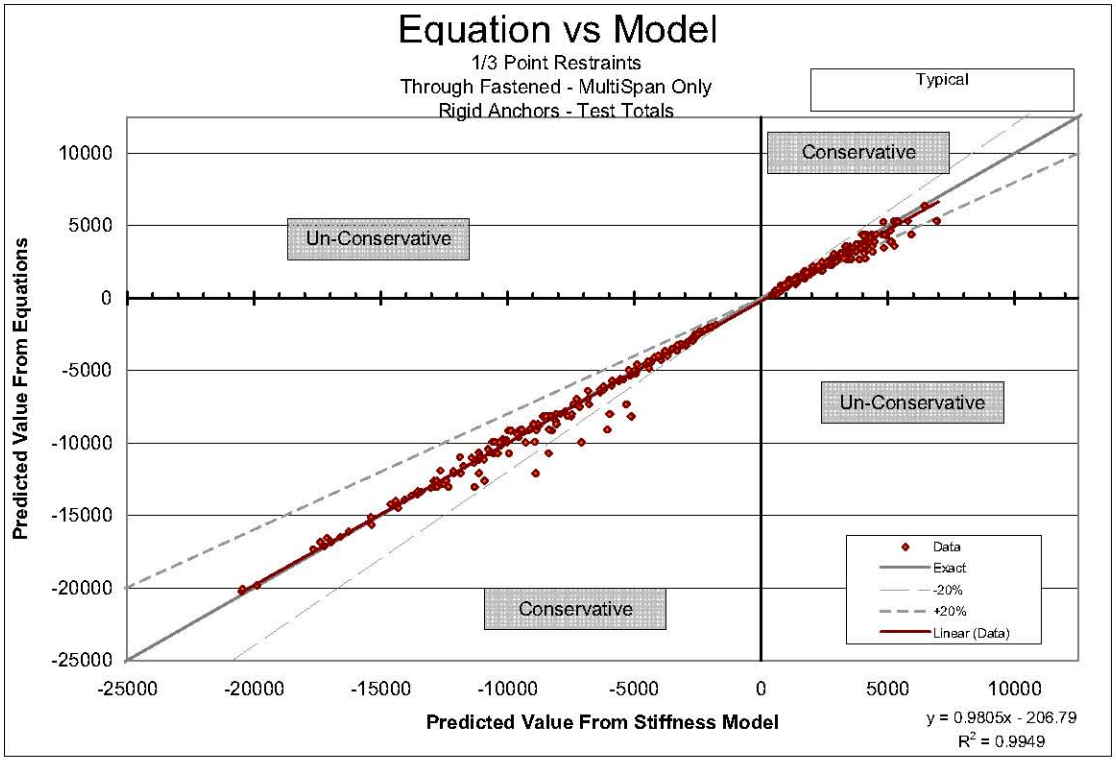
Third-Point Restraints --- Through Fastened Roof ---Multispan, Interior Bays

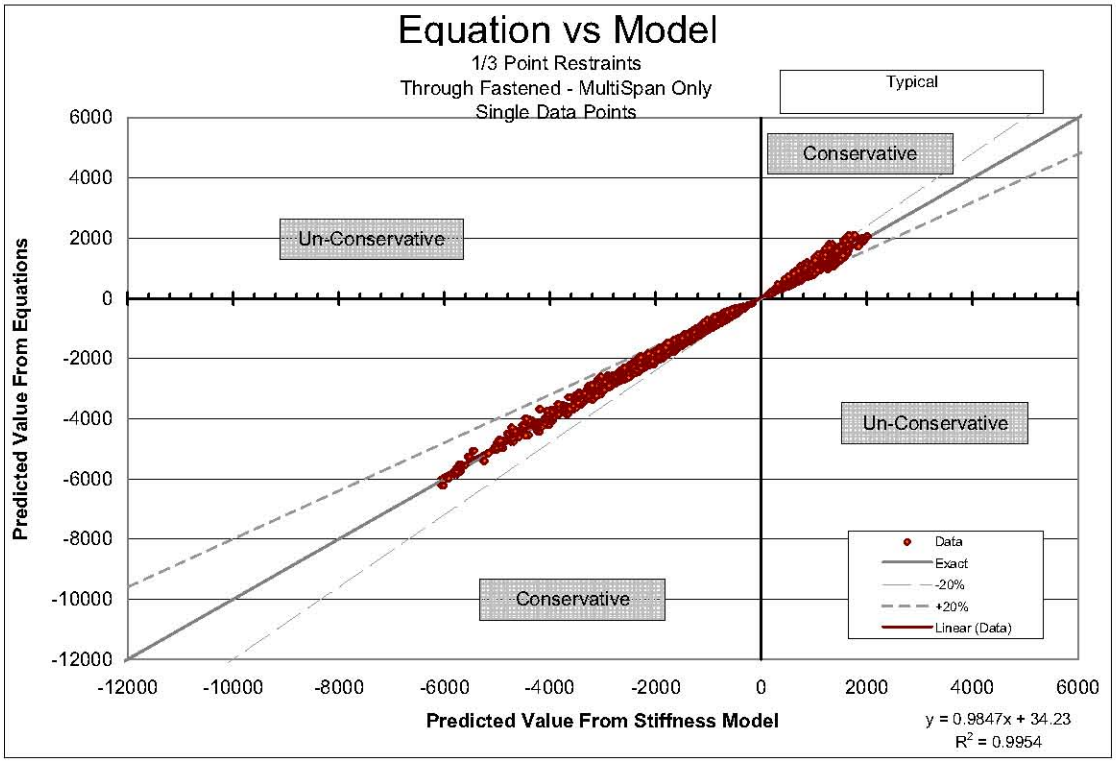
Force Coefficients:

```
[9/25/2006 14:47 "/Graph1" (2454003)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
61.53046        0.98884
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              0.500           0
C2a             0.00605         1.42E-5
C2b             10.2            0.045
C2c             0.962           3.28E-4
----------------------------------------
```

Distribution Coefficients:

```
[9/25/2006 14:57 "/Graph1" (2454003)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
13.93113        0.99289
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              0.500           0
C2a             0.00605         0
C2b             10.2            0
C2c             0.962           0
C3a             6.85E-4         1.51E-5
C3b             0.117           0.0107
----------------------------------------
```


Equation vs Model
1/3 Point Restraints
Through Fastened - MultiSpan Only
Rigid Anchors - Test Totals
Typical
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
10000
5000
0
-5000
-10000
-15000
-20000
-25000
-25000
-20000
-15000
-10000
-5000
0
5000
10000
y = 0.9805x - 206.79
R2 = 0.9949


Equation vs Model
1/3 Point Restraints
Through Fastened - MultiSpan Only
Single Data Points
Typical
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-12000
-10000
-8000
-6000
-4000
-2000
0
2000
4000
6000
y = 0.9847x + 34.23
R2 = 0.9954

Third-Point Restraints --- Standing Seam Roof ---Multispan, End Bay, Exterior Anchor

Force Coefficients:

[9/26/2006 15:43 "/Graph1" (2454004)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL Statistical

Chi^2/DoF	R^2
108.05637	0.9749

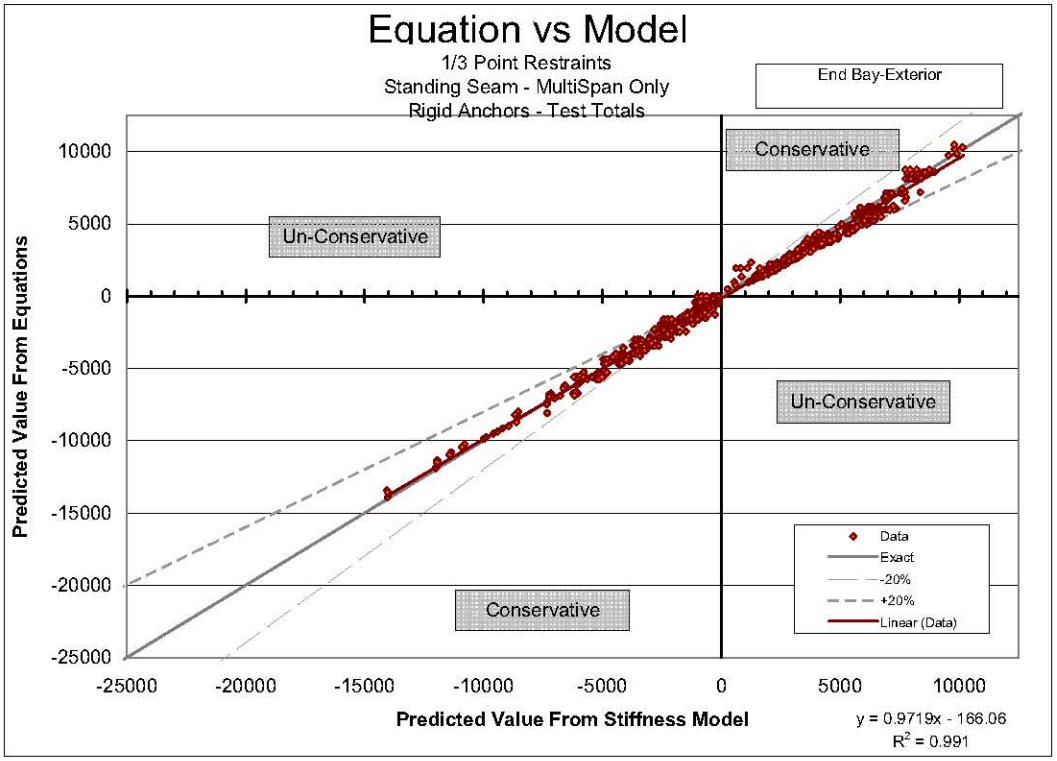
Parameter	Value	Error
C1	0.500	0
C2a	0.0132	1.75E-5
C2b	3.25	0.046
C2c	0.718	3.97E-4

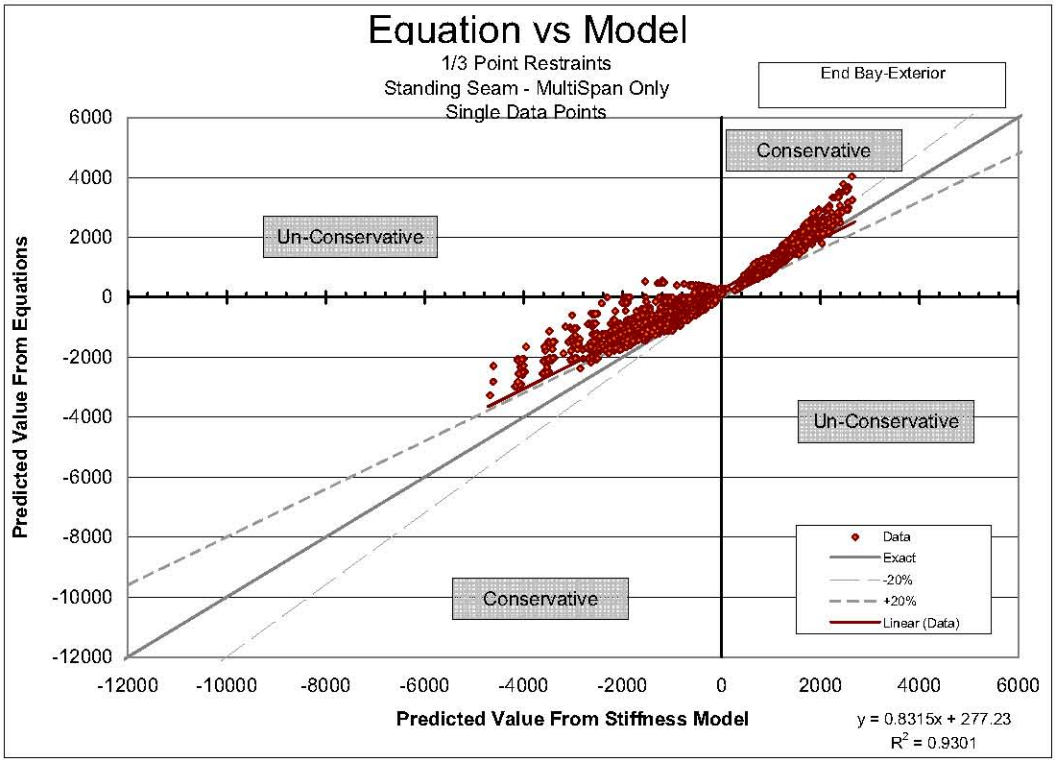
Distribution Coefficients:

[9/26/2006 16:49 "/Graph1" (2454004)]
Data: Data1_PL
Model: PL0808
Weighting:
PL Statistical

Chi^2/DoF	R^2
353.72174	0.80251

Parameter	Value	Error
C1	0.500	0
C2a	0.01320	0
C2b	3.25	0
C2c	0.718	0
C3a	5.91E-4	2.66E-5
C3b	0.0349	0.00373


Equation vs Model
1/3 Point Restraints
Standing Seam - MultiSpan Only
Rigid Anchors - Test Totals
End Bay-Exterior
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
y = 0.9719x - 166.06
R2 = 0.991
10000
5000
0
-5000
-10000
-15000
-20000
-25000
-25000
-20000
-15000
-10000
-5000
0
5000
10000


Equation vs Model
1/3 Point Restraints
Standing Seam - MultiSpan Only
Single Data Points
End Bay-Exterior
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
y = 0.8315x + 277.23
R2 = 0.9301
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-12000
-10000
-8000
-6000
-4000
-2000
0
2000
4000
6000

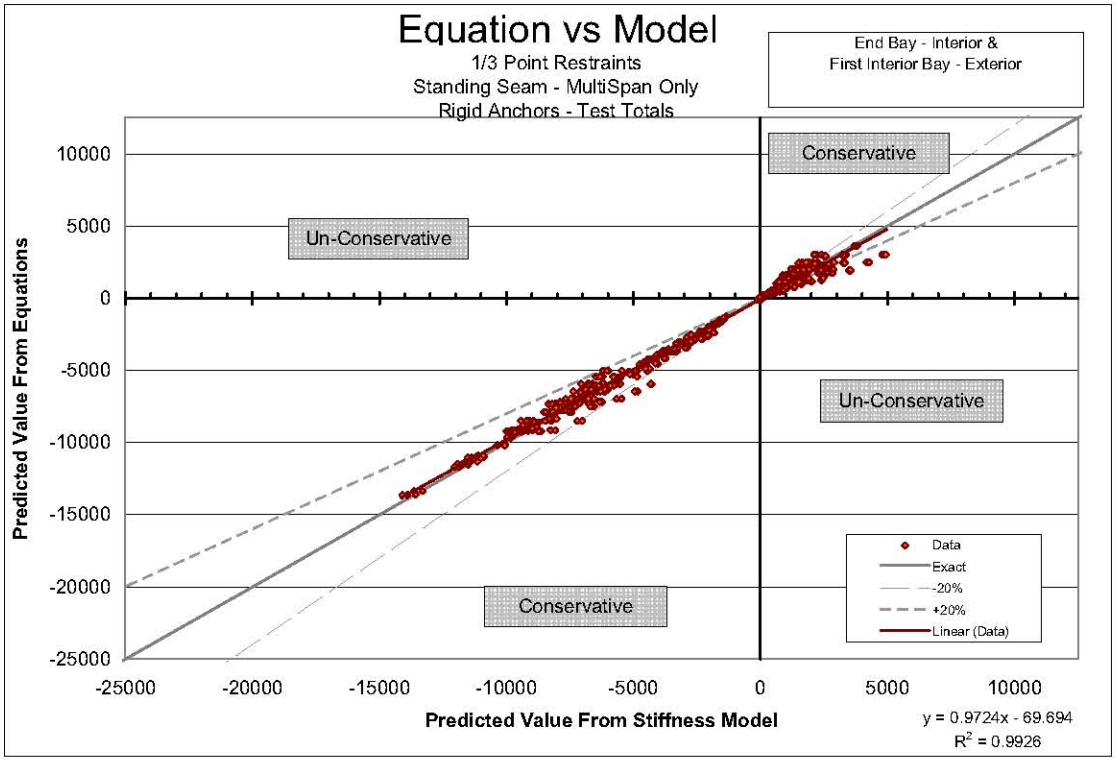
Third-Point Restraints --- Standing Seam Roof ---Multispan, End Bay, Interior Anchor

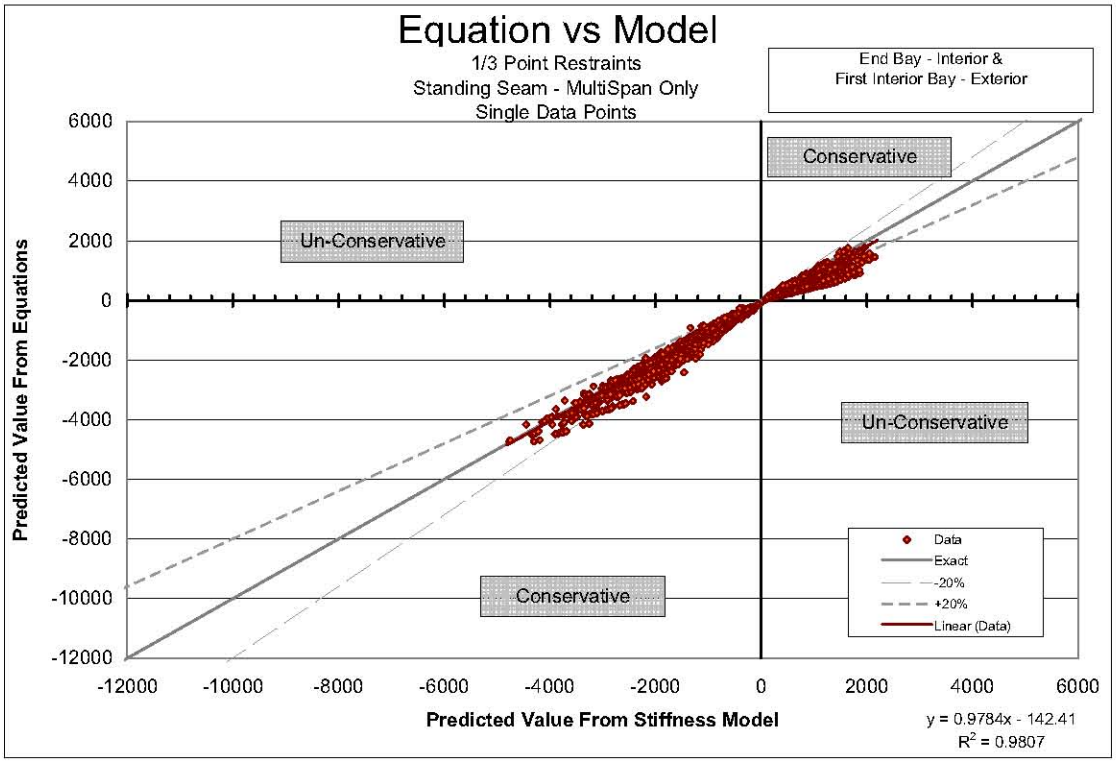
Force Coefficients:

```
[9/26/2006 15:46 "/Graph1" (2454004)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
61.07235        0.98339
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              0.500           0
C2a             8.41E-4         9.81E-6
C2b             14.1            0.033
C2c             0.637           2.68E-4
----------------------------------------
```

Distribution Coefficients:

```
[9/26/2006 16:27 "/Graph1" (2454004)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
75.48526        0.94983
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              0.500           0
C2a             8.41E-4         0
C2b             14.1            0
C2c             0.637           0
C3a             2.02E-4         1.33E-5
C3b             0.137           0.049
----------------------------------------
```


Equation vs Model
1/3 Point Restraints
Standing Seam - MultiSpan Only
Rigid Anchors - Test Totals
End Bay - Interior &
First Interior Bay - Exterior
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
y = 0.9724x - 69.694
R2 = 0.9926


Equation vs Model
1/3 Point Restraints
Standing Seam - MultiSpan Only
Single Data Points
End Bay - Interior &
First Interior Bay - Exterior
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
y = 0.9784x - 142.41
R2 = 0.9807

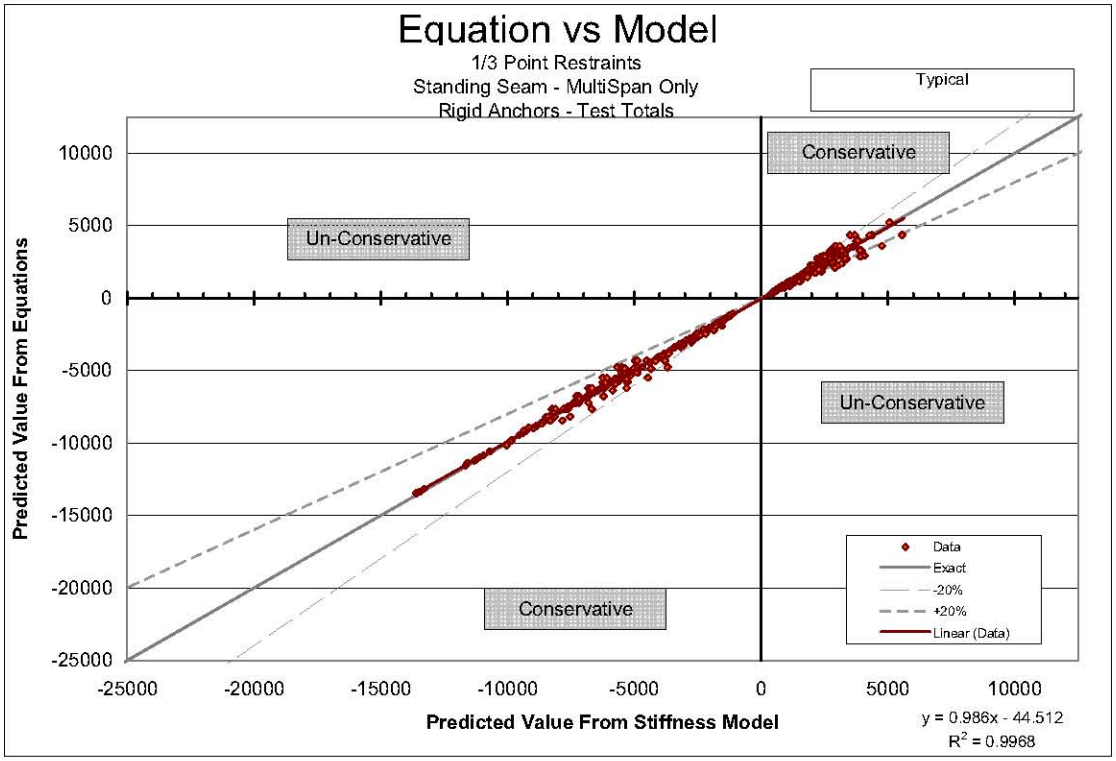
Third-Point Restraints --- Standing Seam Roof ---Multispan, Interior Bays

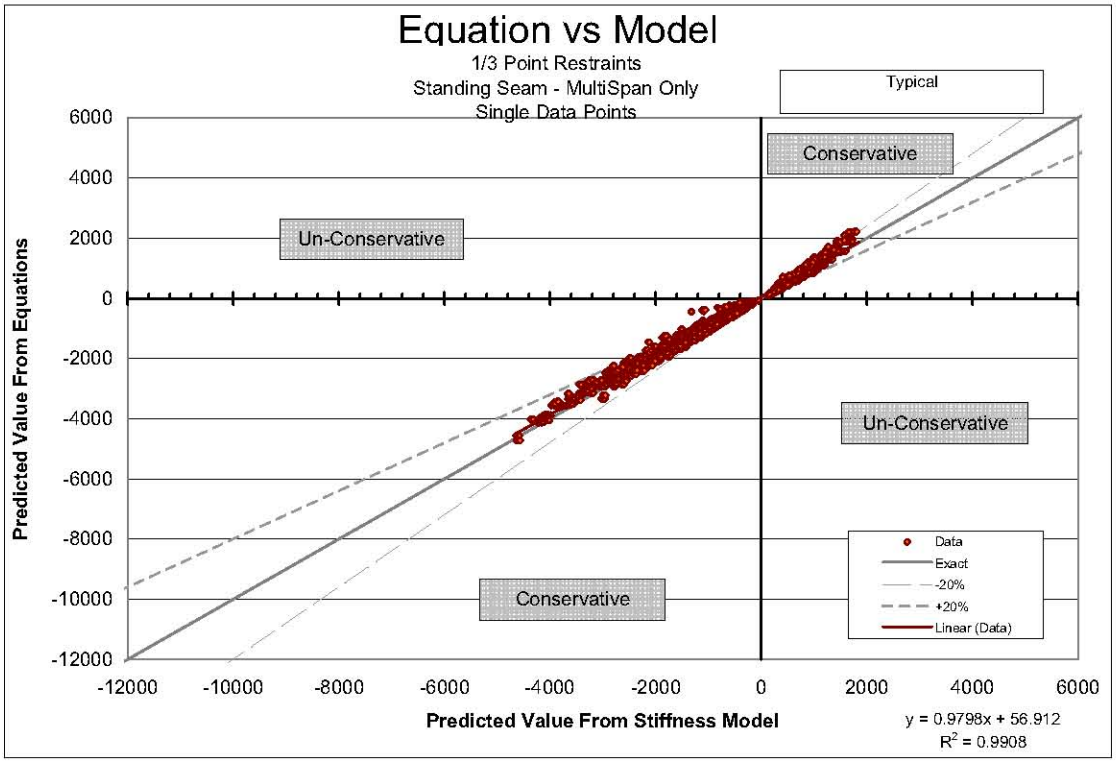
Force Coefficients:

```
[9/26/2006 15:50 "/Graph1" (2454004)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
34.57452        0.99066
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              0.500           0
C2a             0.00383         1.138E-5
C2b             11.3            0.034
C2c             0.646           2.69E-4
----------------------------------------
```

Distribution Coefficients:

```
[9/26/2006 16:41 "/Graph1" (2454004)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
31.6922         0.97897
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              0.500           0
C2a             0.00383         0
C2b             11.3            0
C2c             0.646           0
C3a             1.04E-4         1.41E-5
C3b             0.0143          0.00291
----------------------------------------
```


Equation vs Model
1/3 Point Restraints
Standing Seam - MultiSpan Only
Rigid Anchors - Test Totals
Typical
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
10000
5000
0
-5000
-10000
-15000
-20000
-25000
-25000
-20000
-15000
-10000
-5000
0
5000
10000
y = 0.986x - 44.512
R2 = 0.9968


Equation vs Model
1/3 Point Restraints
Standing Seam - MultiSpan Only
Single Data Points
Typical
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-12000
-10000
-8000
-6000
-4000
-2000
0
2000
4000
6000
y = 0.9798x + 56.912
R2 = 0.9908

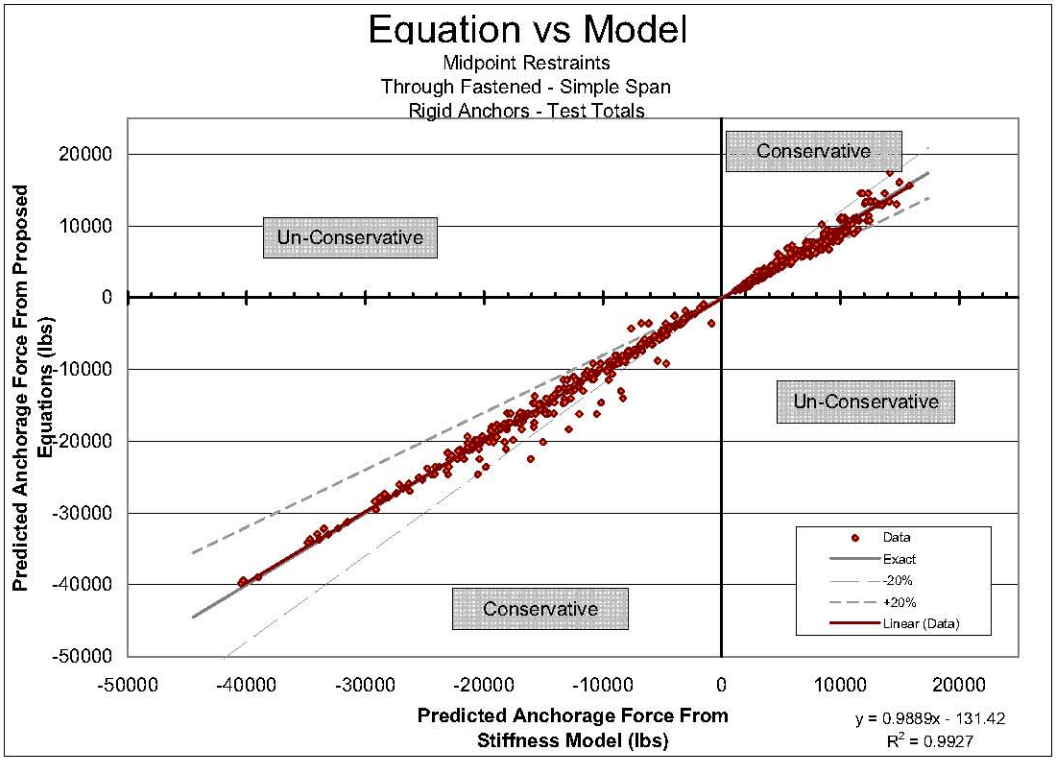
MidPoint Restraints --- Through Fastened Roof ---Simple Span

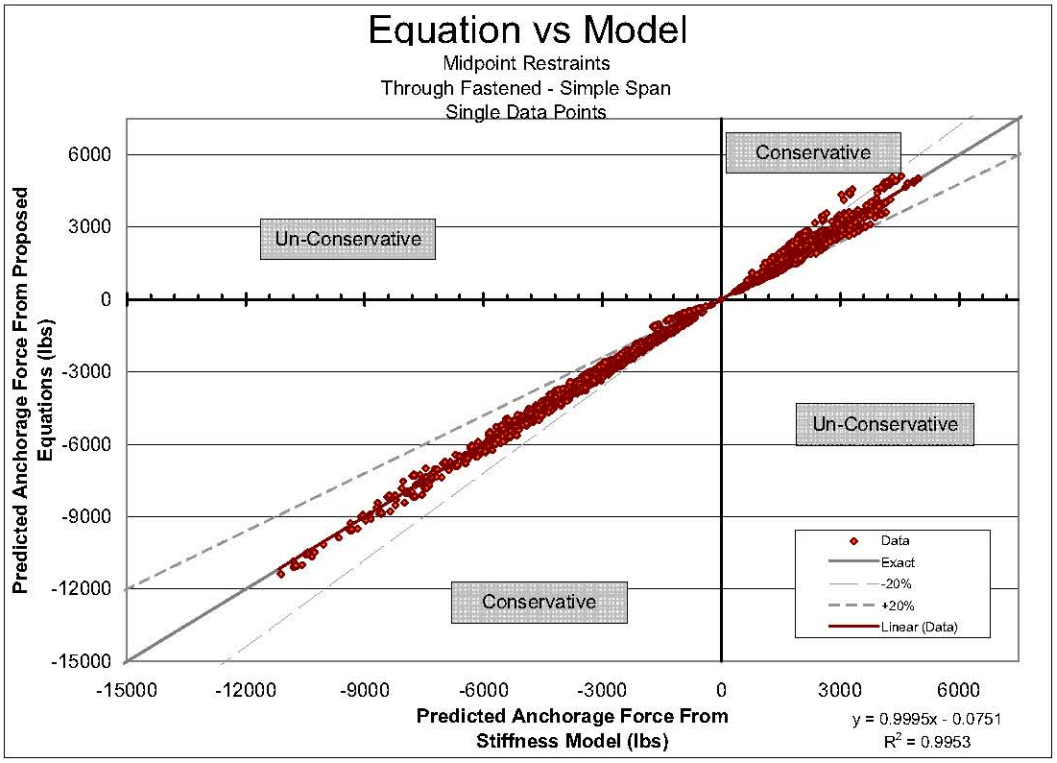
Force Coefficients:

```
[9/24/2006 20:16 "/Graph1" (2454002)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
125.12609       0.98867
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00760         1.491E-5
C2b             11.1            0.046
C2c             0.959           3.27E-4
----------------------------------------
```

Distribution Coefficients:

```
[9/24/2006 20:49 "/Graph1" (2454002)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
17.82529        0.9925
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00760         0
C2b             11.1            0
C2c             0.959           0
C3a             7.53E-4         2.09E-6
C3b             0.419           0.0069
----------------------------------------
```


Equation vs Model
Midpoint Restraints
Through Fastened - Simple Span
Rigid Anchors - Test Totals
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Anchorage Force From Proposed Equations (lbs)
Predicted Anchorage Force From Stiffness Model (lbs)
y = 0.9889x - 131.42
R2 = 0.9927


Equation vs Model
Midpoint Restraints
Through Fastened - Simple Span
Single Data Points
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Anchorage Force From Proposed Equations (lbs)
Predicted Anchorage Force From Stiffness Model (lbs)
y = 0.9995x - 0.0751
R2 = 0.9953

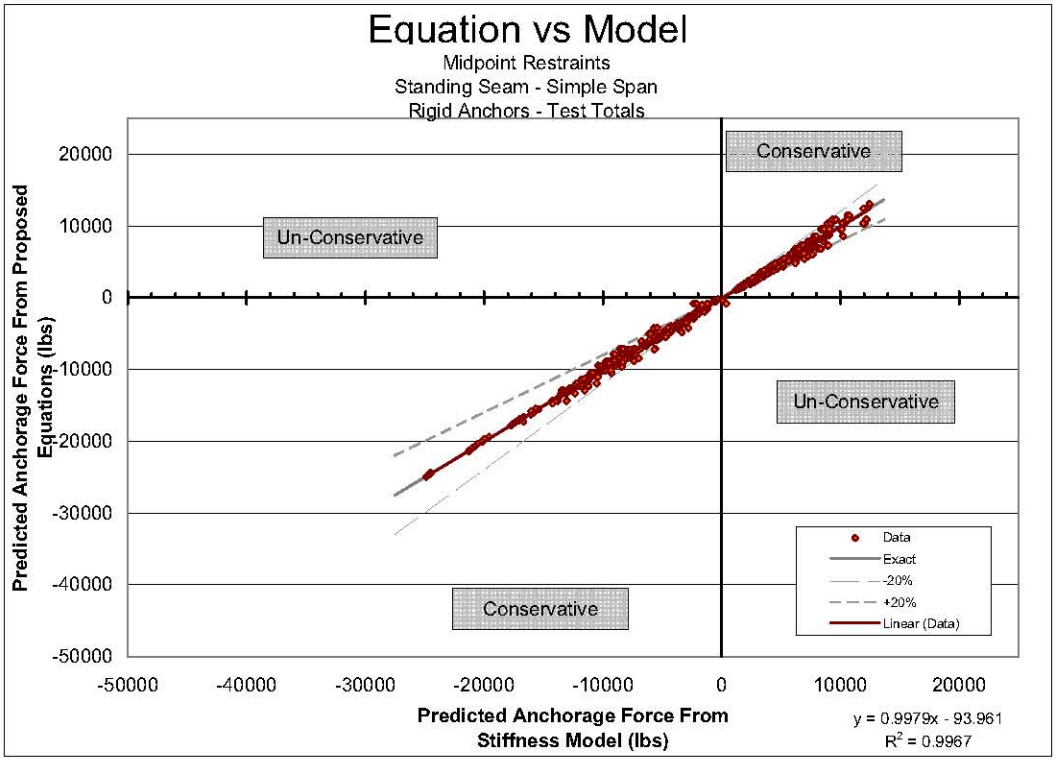
MidPoint Restraints --- Standing Seam Roof ---Simple Span

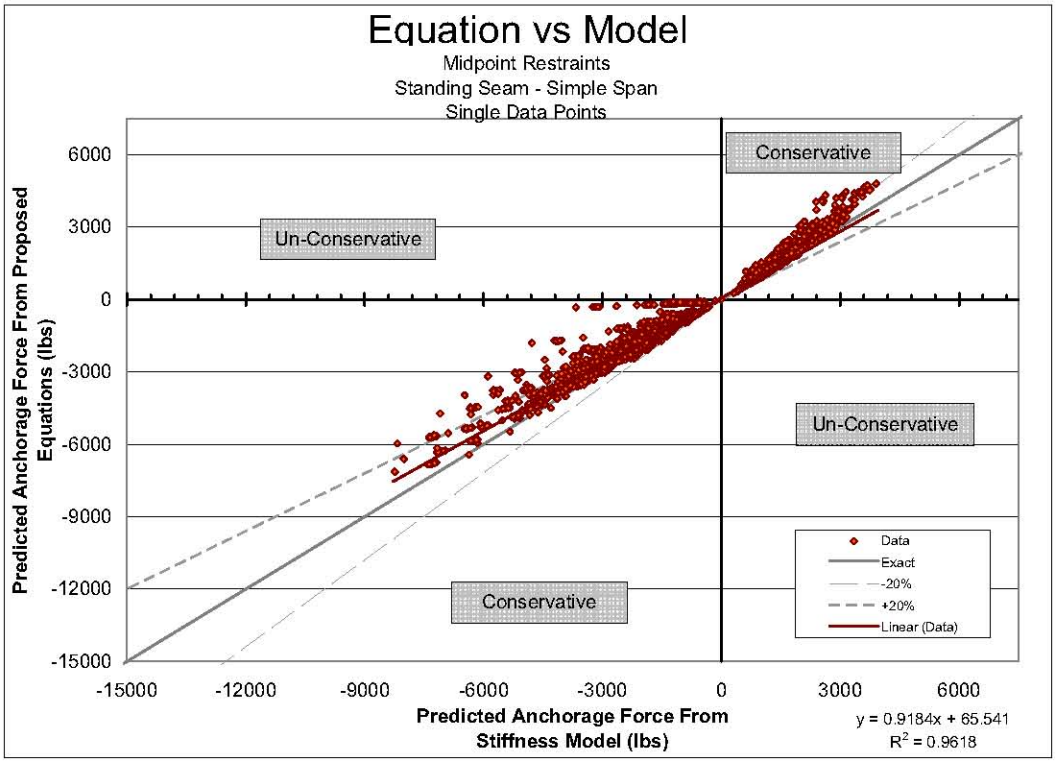
Force Coefficients:

```
[9/24/2006 21:08 "/Graph1" (2454002)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
39.31646        0.99445
----------------------------------------

Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00755         1.215E-5
C2b             3.64            0.035
C2c             0.616           2.61E-4
----------------------------------------
```

Distribution Coefficients:

```
[9/24/2006 21:26 "/Graph1" (2454002)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
78.40587        0.95382
----------------------------------------

Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00755         0
C2b             3.64            0
C2c             0.616           0
C3a             3.52E-4         1.81E-6
C3b             0.176           0.00275
----------------------------------------
```


Equation vs Model
Midpoint Restraints
Standing Seam - Simple Span
Rigid Anchors - Test Totals
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Anchorage Force From Proposed Equations (lbs)
Predicted Anchorage Force From Stiffness Model (lbs)
20000
10000
0
-10000
-20000
-30000
-40000
-50000
-50000
-40000
-30000
-20000
-10000
0
10000
20000
y = 0.9979x - 93.961
R2 = 0.9967


Equation vs Model
Midpoint Restraints
Standing Seam - Simple Span
Single Data Points
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Anchorage Force From Proposed Equations (lbs)
Predicted Anchorage Force From Stiffness Model (lbs)
6000
3000
0
-3000
-6000
-9000
-12000
-15000
-15000
-12000
-9000
-6000
-3000
0
3000
6000
y = 0.9184x + 65.541
R2 = 0.9618

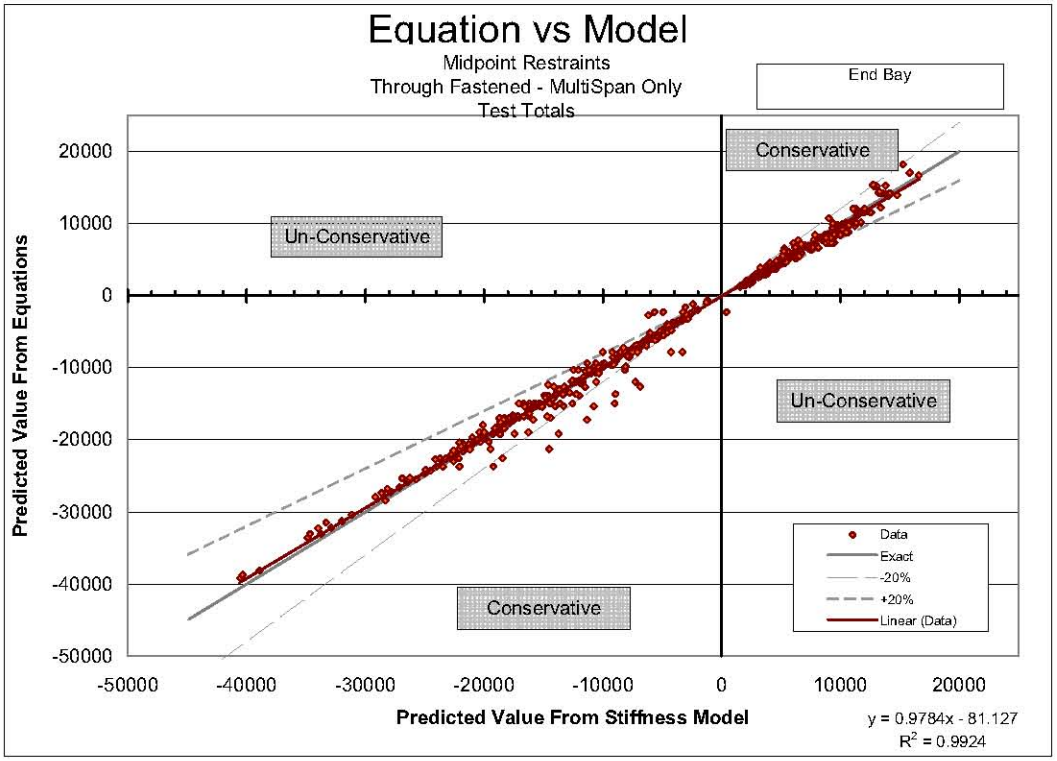
MidPoint Restraints --- Through Fastened Roof ---Multispan, End Bay

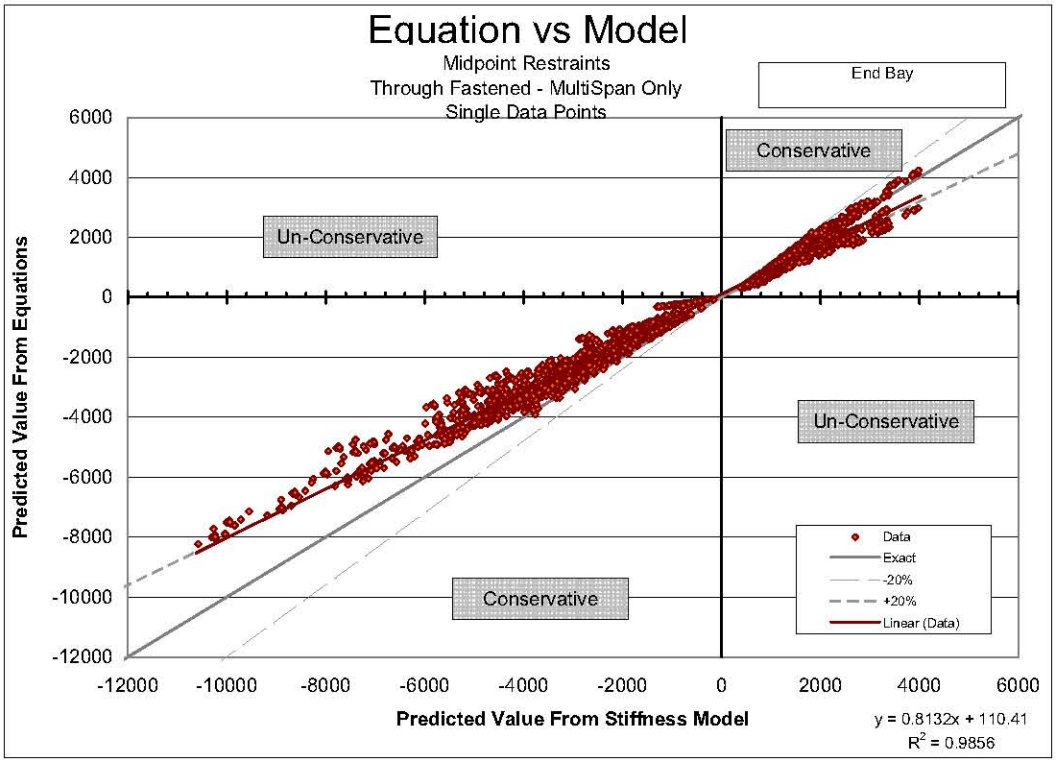
Force Coefficients:

```
[9/29/2006 10:57 "/Graph1" (2454007)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
154.65341       0.98595
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00827         1.495E-5
C2b             11.7            0.045
C2c             0.953           3.26E-4
----------------------------------------
```

Distribution Coefficients:

```
[9/29/2006 13:41 "/Graph1" (2454007)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
124.93835       0.94261
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00827         0
C2b             11.7            0
C2c             0.953           0
C3a             0.003109        5.043E-6
C3b             0.335           0.0038
----------------------------------------
```


Equation vs Model
Midpoint Restraints
Through Fastened - MultiSpan Only
Test Totals
End Bay
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
20000
10000
0
-10000
-20000
-30000
-40000
-50000
-50000
-40000
-30000
-20000
-10000
0
10000
20000
y = 0.9784x - 81.127
R2 = 0.9924


Equation vs Model
Midpoint Restraints
Through Fastened - MultiSpan Only
Single Data Points
End Bay
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-12000
-10000
-8000
-6000
-4000
-2000
0
2000
4000
6000
y = 0.8132x + 110.41
R2 = 0.9856

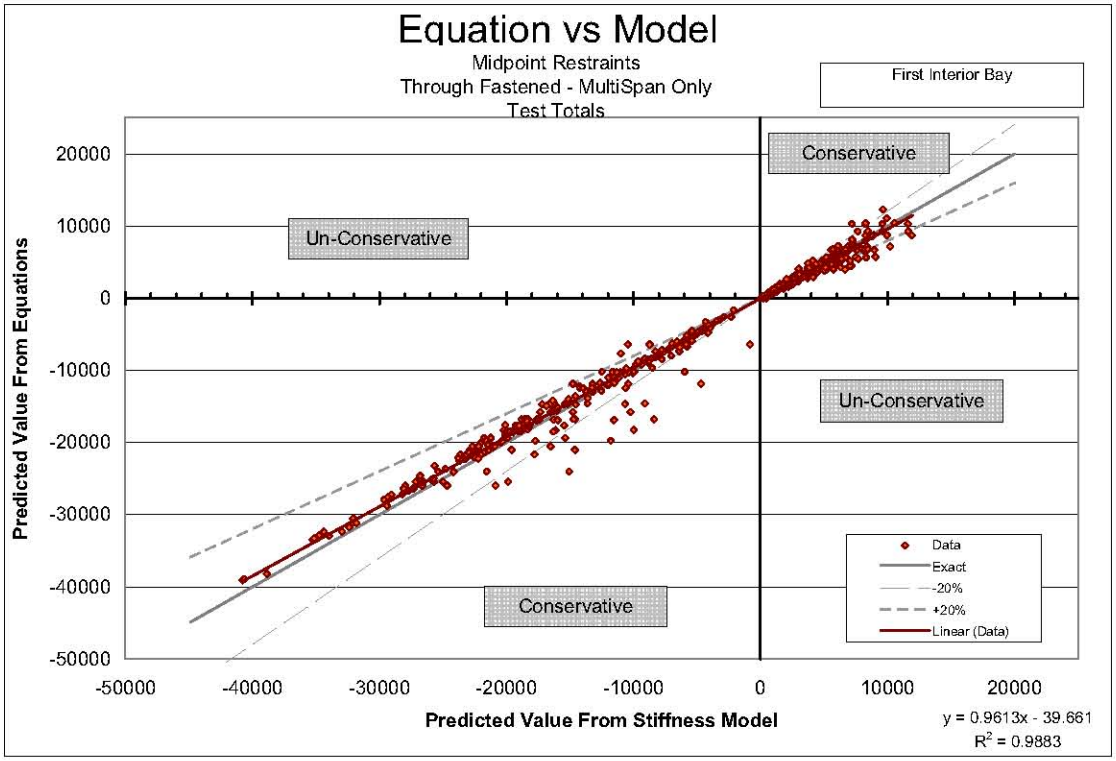
MidPoint Restraints --- Through Fastened Roof ---Multispan, First Interior Bay

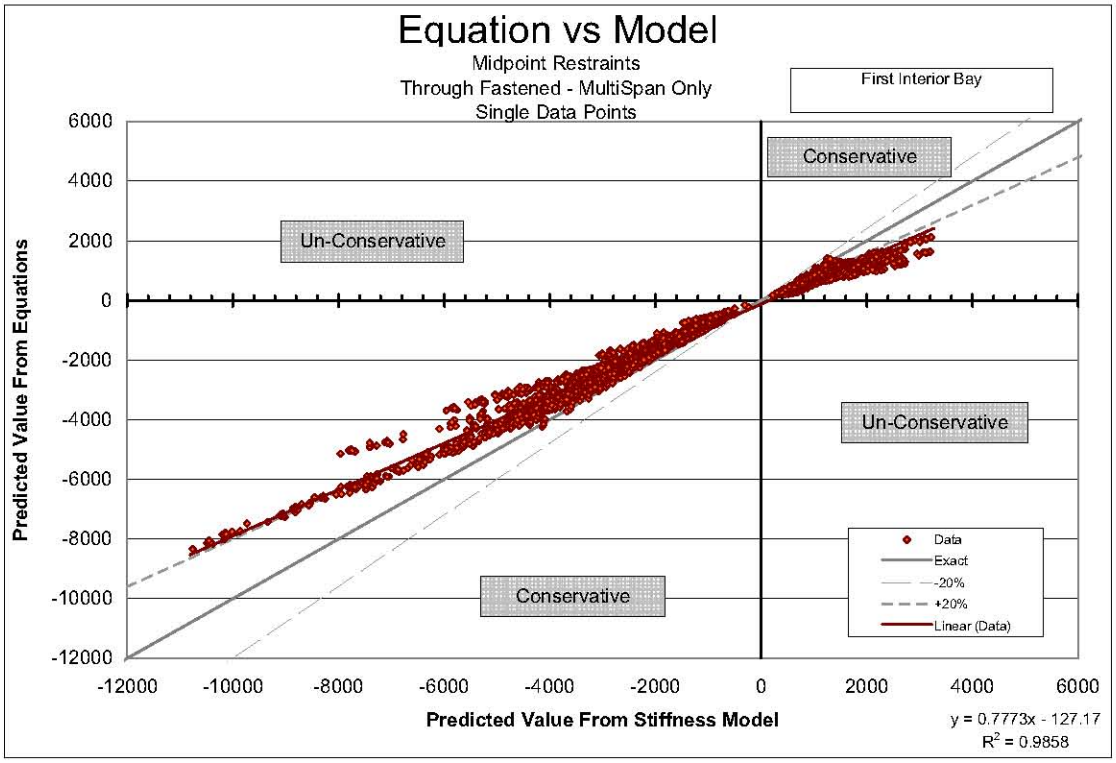
Force Coefficients:

```
[9/29/2006 11:02 "/Graph1" (2454007)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
221.38551       0.97928
----------------------------------------

Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00360         1.249E-5
C2b             13.3            0.041
C2c             0.922           3.22E-4
----------------------------------------
```

Distribution Coefficients:

```
[9/29/2006 13:29 "/Graph1" (2454007)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
100.54133       0.9517
----------------------------------------

Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00360         0
C2b             13.3            0
C2c             0.922           0
C3a             0.00388         6.407E-6
C3b             0.361           0.0045
----------------------------------------
```


Equation vs Model
Midpoint Restraints
Through Fastened - MultiSpan Only
Test Totals
First Interior Bay
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
20000
10000
0
-10000
-20000
-30000
-40000
-50000
-50000
-40000
-30000
-20000
-10000
0
10000
20000
y = 0.9613x - 39.661
R2 = 0.9883


Equation vs Model
Midpoint Restraints
Through Fastened - MultiSpan Only
Single Data Points
First Interior Bay
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-12000
-10000
-8000
-6000
-4000
-2000
0
2000
4000
6000
y = 0.7773x - 127.17
R2 = 0.9858

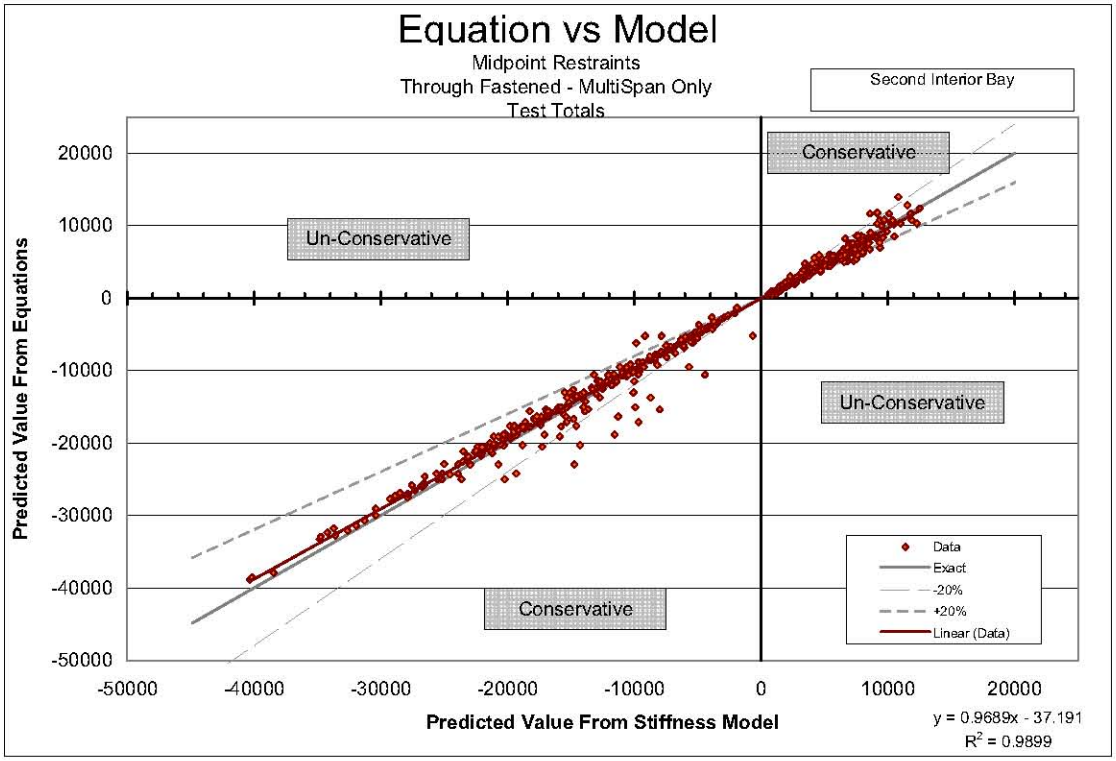
MidPoint Restraints --- Through Fastened Roof ---Multispan, Typical Interior Bay

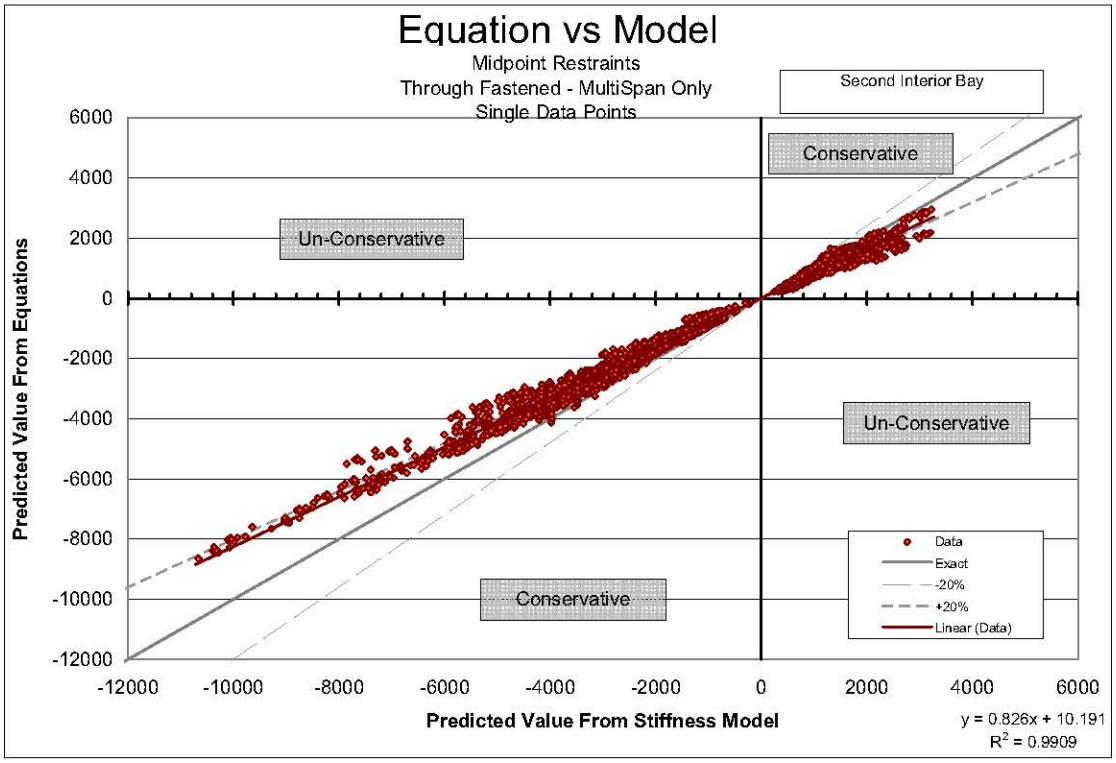
Force Coefficients:

```
[9/29/2006 11:08 "/Graph1" (2454007)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
193.50802       0.98193
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00544         1.375E-5
C2b             11.5            0.043
C2c             0.926           3.22E-4
----------------------------------------
```

Distribution Coefficients:

```
[9/29/2006 14:03 "/Graph1" (2454007)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
98.2386         0.95258
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00544         0
C2b             11.5            0
C2c             0.926           0
C3a             0.003142        5.224E-6
C3b             0.305           0.0033
----------------------------------------
```


Equation vs Model
Midpoint Restraints
Through Fastened - MultiSpan Only
Test Totals
Second Interior Bay
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
y = 0.9689x - 37.191
R2 = 0.9899


Equation vs Model
Midpoint Restraints
Through Fastened - MultiSpan Only
Single Data Points
Second Interior Bay
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
y = 0.826x + 10.191
R2 = 0.9909

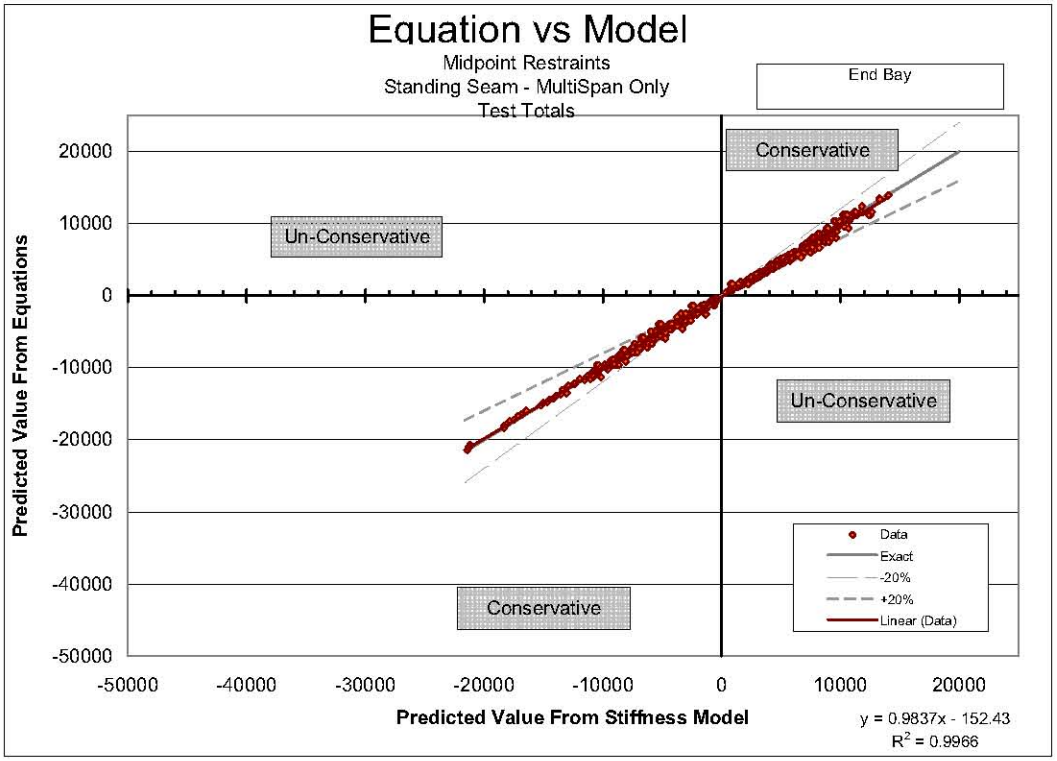
MidPoint Restraints --- Standing Seam Roof ---Multispan, End Bay

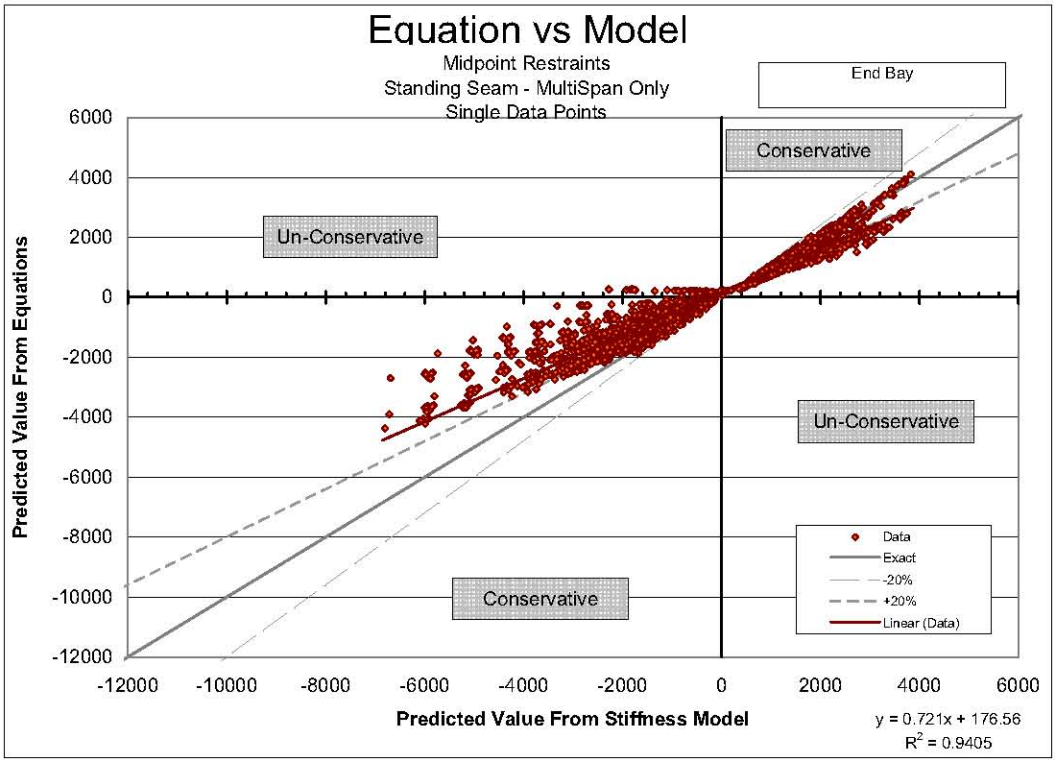
Force Coefficients:

```
[9/29/2006 15:31 "/Graph1" (2454007)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
41.64149        0.9934
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00795         1.165E-5
C2b             4.82            0.033
C2c             0.542           2.45E-4
----------------------------------------
```

Distribution Coefficients:

```
[9/29/2006 16:11 "/Graph1" (2454007)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
162.36169       0.88702
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00795         0
C2b             4.82            0
C2c             0.542           0
C3a             0.00200         5.83E-6
C3b             0.0804          7.733E-4
----------------------------------------
```


Equation vs Model
Midpoint Restraints
Standing Seam - MultiSpan Only
Test Totals
End Bay
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
20000
10000
0
-10000
-20000
-30000
-40000
-50000
-50000
-40000
-30000
-20000
-10000
0
10000
20000
y = 0.9837x - 152.43
R2 = 0.9966


Equation vs Model
Midpoint Restraints
Standing Seam - MultiSpan Only
Single Data Points
End Bay
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-12000
-10000
-8000
-6000
-4000
-2000
0
2000
4000
6000
y = 0.721x + 176.56
R2 = 0.9405

MidPoint Restraints --- Standing Seam Roof ---Multispan, First Interior Bay

Force Coefficients:

[9/29/2006 15:39 "/Graph1" (2454007)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL Statistical

Chi^2/DoF	R^2
83.66787	0.98463

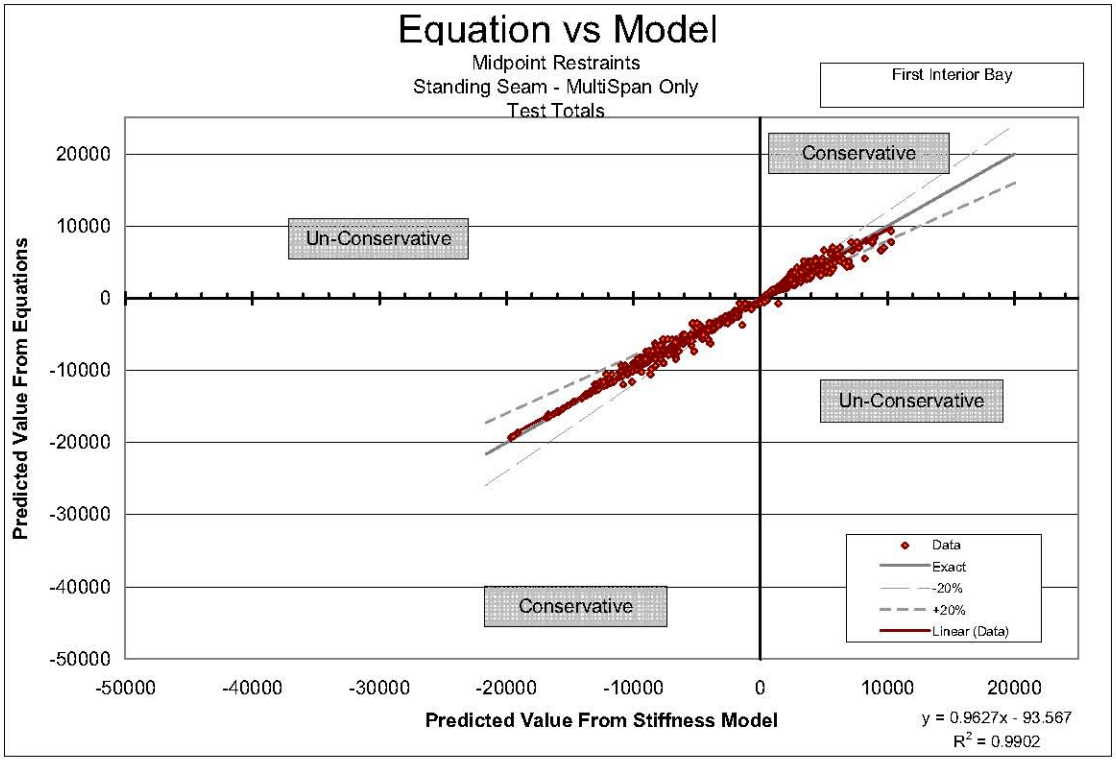
Parameter	Value	Error
C1	1.00	0
C2a	0.00249	1.01E-5
C2b	10.2	0.0313
C2c	0.465	2.29E-4

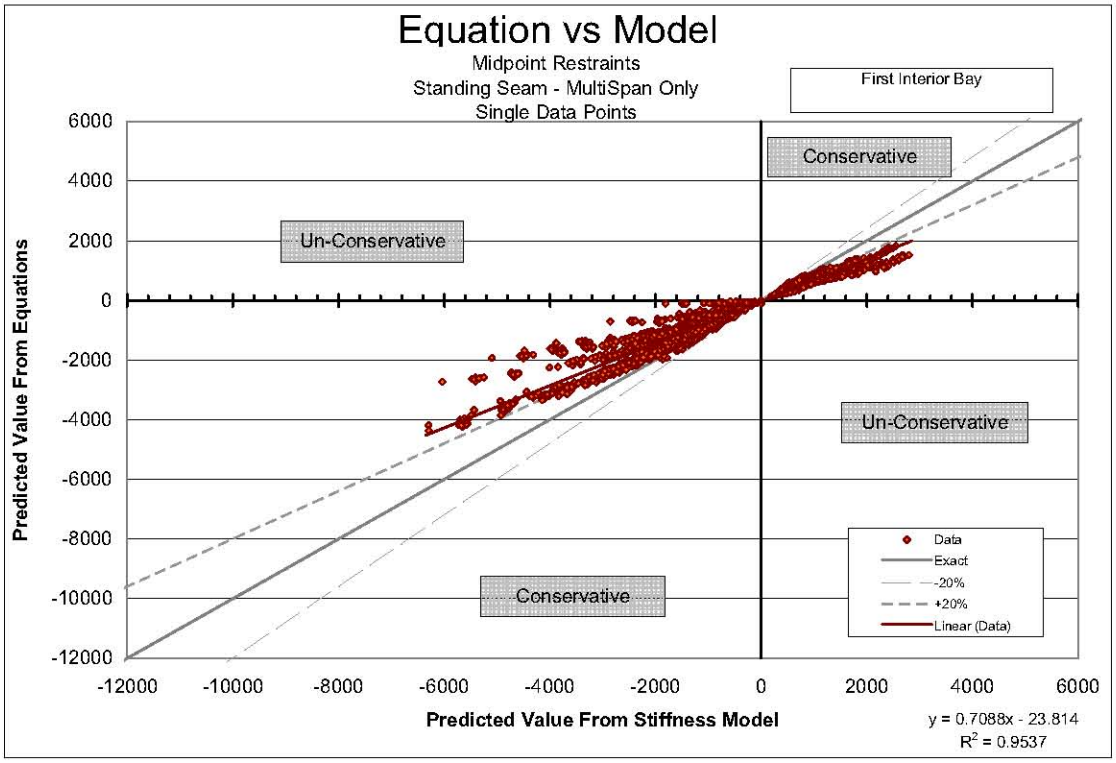
Distribution Coefficients:

[9/29/2006 20:00 "/Graph1" (2454007)]
Data: Data1_PL
Model: PL0808
Weighting:
PL Statistical

Chi^2/DoF	R^2
92.12576	0.92425

Parameter	Value	Error
C1	1.00	0
C2a	0.002490	0
C2b	10.2	0
C2c	0.465	0
C3a	0.00256	7.31E-6
C3b	0.1331	0.001687


Equation vs Model
Midpoint Restraints
Standing Seam - MultiSpan Only
Test Totals
First Interior Bay
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
y = 0.9627x - 93.567
R2 = 0.9902


Equation vs Model
Midpoint Restraints
Standing Seam - MultiSpan Only
Single Data Points
First Interior Bay
Conservative
Un-Conservative
Un-Conservative
Conservative
Data
Exact
-20%
+20%
Linear (Data)
Predicted Value From Equations
Predicted Value From Stiffness Model
y = 0.7088x - 23.814
R2 = 0.9537

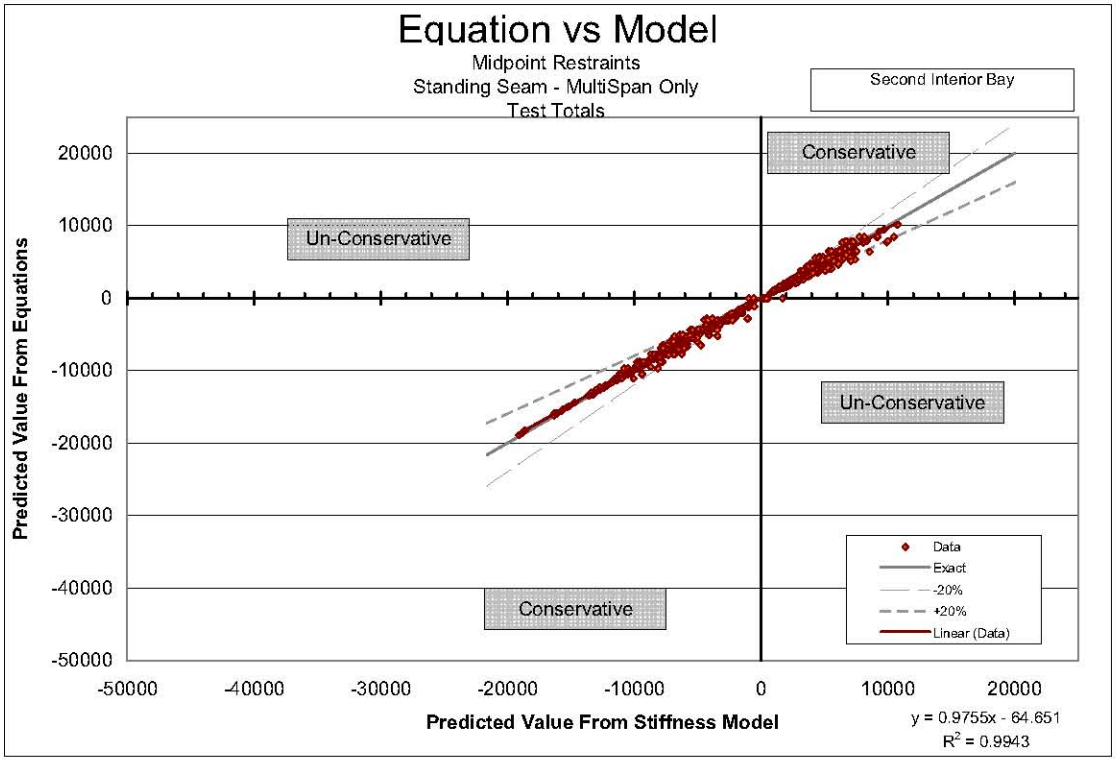
MidPoint Restraints --- Standing Seam Roof ---Multispan, Typical Interior Bay

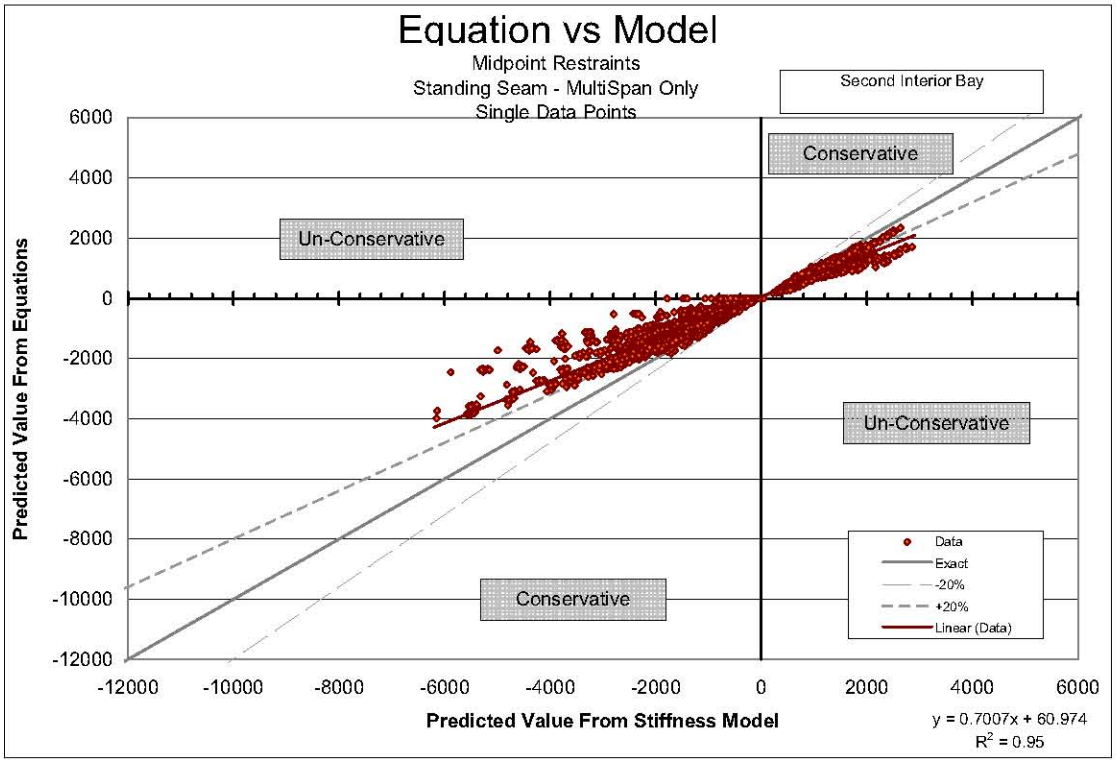
Force Coefficients:

```
[9/29/2006 15:42 "/Graph1" (2454007)]
Data: Data1_PL
Model: PLSumNoKsys
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
46.57804        0.99133
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00413         1.028E-5
C2b             7.66            0.0298
C2c             0.464           2.29E-4
----------------------------------------
```

Distribution Coefficients:

```
[9/29/2006 20:12 "/Graph1" (2454007)]
Data: Data1_PL
Model: PL0808
Weighting:
PL              Statistical

Chi^2/DoF       R^2
----------------------------------------
103.46087       0.9144
----------------------------------------


Parameter       Value           Error
----------------------------------------
C1              1.00            0
C2a             0.00413         0
C2b             7.66            0
C2c             0.464           0
C3a             0.00271         7.5E-6
C3b             0.1455          0.001897
----------------------------------------
```


Equation vs Model
Midpoint Restraints
Standing Seam - MultiSpan Only
Test Totals
Second Interior Bay
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Value From Equations
Predicted Value From Stiffness Model
Data
Exact
-20%
+20%
Linear (Data)
y = 0.9755x - 64.651
R2 = 0.9943


Equation vs Model
Midpoint Restraints
Standing Seam - MultiSpan Only
Single Data Points
Second Interior Bay
Conservative
Un-Conservative
Un-Conservative
Conservative
Predicted Value From Equations
Predicted Value From Stiffness Model
Data
Exact
-20%
+20%
Linear (Data)
y = 0.7007x + 60.974
R2 = 0.95

APPENDIX D:
DRAFT SPECIFICATION AND COMMENTARY LANGUAGE

D3.2.1 Anchorage of Bracing for Purlin Roof Systems Under Gravity Load With Top Flange Connected to Metal Sheathing

Anchorage, in the form of a device capable of transferring force from the roof diaphragm to a support, shall be provided for roof systems with C-sections or Z-sections designed according to Section C3.1 having through-fastened or standing seam sheathing attached to the top flanges. Each anchorage device shall be designed to resist the force, P_L, determined by Equation D3.2.1-1 and shall satisfy the minimum stiffness requirement of Equation D3.2.1-7. In addition, purlins shall be restrained laterally by the sheathing so that the maximum top flange lateral displacements between lines of lateral anchorage at nominal loads do not exceed the span length divided by 360.

Anchorage devices shall be located in each purlin bay and must connect to the purlin at or near the purlin top flange. If anchorage devices are not directly connected to all purlin lines of each purlin bay, provision shall be made to transmit the forces from other purlin lines to the anchorage devices. It shall be demonstrated that the required force, P_L, can be transferred to the anchorage device through the roof sheathing and its fastening system. The lateral stiffness of the anchorage device shall be determined by analysis or testing. This analysis or testing shall account for the flexibility of the purlin web above the attachment of the anchorage device connection.

$$P_{L_j} = \sum_{i=1}^{N_p} \left(P_i \frac{K_{eff\,i,j}}{K_{total\,i}} \right) \qquad (Eq.\ \text{D3.2.1-1})$$

with

$$P_i = C1 \cdot W_{p_i} \cdot \left[\left(\frac{C2}{1000} \cdot \frac{I_{xy} L}{I_x d} + C3 \cdot \frac{(m + 0.25b)t}{d^2} \right) \alpha \cdot \cos\theta - C4 \cdot \sin\theta \right] \qquad (Eq.\ \text{D3.2.1-2})$$

$$K_{total\,i} = \sum_{j=1}^{N_a} \left(K_{eff\,i,j} \right) + K_{sys} \qquad (Eq.\ \text{D3.2.1-3})$$

$$K_{sys} = \frac{C5}{1000} \cdot N_p \cdot \frac{ELt^2}{d^2} \qquad (Eq.\ \text{D3.2.1-4})$$

$$K_{eff\,i,j} = \left[\frac{1}{K_a} + \frac{d_{p_{i,j}}}{C6 \cdot LA_p E} \right]^{-1} \qquad (Eq.\ \text{D3.2.1-5})$$

$$W_{p_i} = w_i L \qquad (Eq.\ \text{D3.2.1-6})$$

where

P_{L_j} = Lateral force to be resisted by the j[th] anchorage device (positive when restraint is required to prevent purlins from translating in the upward roof slope direction)

P_i = Lateral force introduced into the system at the i[th] purlin

K_{total_i} = Effective lateral stiffness of all elements resisting force P_i

K_{sys} = Lateral stiffness of the roof system, neglecting anchorage devices

$K_{eff_{i,j}}$ = Effective lateral stiffness of the j[th] anchorage device with respect to the i[th]

purlin

W_{pi} = Total vertical load supported by the i^{th} purlin in a single bay

i = Index for each purlin line (i=1,2… N_p)

j = Index for each anchorage device (j=1,2… N_a)

N_p = Number of purlin lines on roof slope

I_{xy} = Product of inertia of full unreduced section about centroidal axes parallel and perpendicular to the purlin web (I_{xy}=0 for C-Sections)

I_x = Moment of inertia of full unreduced section about centroidal axis perpendicular to the purlin web

d = Depth of purlin

b = Top flange width of purlin

t = Purlin thickness

m = Distance from shear center to mid-plane of web (m=0 for Z-Sections)

α = +1 for top flange facing in the up-slope direction
-1 for top flange facing in the down-slope direction

E = Modulus of elasticity of steel

A_p = Gross cross-sectional area of roof panel per unit width

$d_{pi,j}$ = Distance along roof slope between the i^{th} purlin line and the j^{th} anchorage device

L = Purlin span length

θ = Angle between vertical and plane of purlin web

w_i = Distributed gravity load supported by the i^{th} purlin per unit length (determined from the critical load combination for ASD, LRFD or LSD)

N_a = Number of anchorage devices along a line of anchorage

K_a = Lateral stiffness of the anchorage device

The coefficients C1, C2, C3, C4, C5 and C6 are tabulated in Tables D3.2.1-1 to D3.2.1-3.

For systems with multiple spans and anchorage devices at supports (support restraints), where the two adjacent bays have different section properties or span lengths, the following procedures shall be used. The values for P_i in Equation D3.2.1-1 and Equation D3.2.1-8 shall be taken as the average of the values found from Equation D3.2.1-2 evaluated separately for each of the two bays. The values of K_{sys} and $K_{eff_{i,j}}$ in Equation D3.2.1-1 and Equation D3.2.1-3 shall be calculated using Equation D3.2.1-4 and Equation D3.2.1-5 with L, t and d taken as the average values of the two bays.

For systems with multiple spans and anchorage devices at either 1/3 points or mid-points, where the adjacent bays have different section properties or span lengths than the bay under consideration, the following procedures shall be used to account for the influence of the adjacent bays. The values for P_i in Equation D3.2.1-1 and Equation D3.2.1-8 shall be taken as the average of the values found from Equation D3.2.1-2 evaluated separately for each of the three bays. The value of K_{sys} in Equation D3.2.1-3 shall be calculated using Equation D3.2.1-4 with L, t and d taken as the average of the values from the three bays. The values of $K_{eff_{i,j}}$ shall be calculated using Equation D3.2.1-5 with L taken as the span length of the bay under consideration. At an end bay, when computing

the average values for P_i or averaging the properties for computing K_{sys}, the averages shall be found by adding the value from the first interior bay and two times the value from the end bay and then dividing the sum by three.

The total effective stiffness at each purlin shall satisfy the following equation:

$$K_{total\ i} \geq K_{req} \qquad (Eq.\ D3.2.1\text{-}7)$$

where

$$K_{req} = \Omega \cdot \frac{20 \cdot \left| \sum_{i=1}^{N_p} P_i \right|}{d} \text{ (ASD)} \quad \text{Or} \qquad (Eq.\ D3.2.1\text{-}8a)$$

$$K_{req} = \frac{1}{\phi} \cdot \frac{20 \cdot \left| \sum_{i=1}^{N_p} P_i \right|}{d} \text{ (LRFD, LSD)} \qquad (Eq.\ D3.2.1\text{-}8b)$$

In lieu of the Equations D3.2.1-1 through D3.2.1-6, lateral restraint forces shall be permitted to be determined from rational analysis. Rational analysis shall be first or second order and account for the effects of roof slope, torsion resulting from applied loads eccentric to shear center, torsion resulting from the lateral resistance provided by the sheathing, and load applied oblique to the principal axes. Rational analysis shall also include the effects of the lateral and rotational restraint provided by sheathing attached to the top flange. Stiffness of the anchorage device shall be considered and shall account for flexibility of the purlin web above the attachment of the anchorage device connection.

When lateral restraint forces are determined from rational analysis, the maximum top flange lateral displacement of the purlin between lines of lateral bracing at nominal loads shall not exceed the span length divided by 360. The lateral displacement of the purlin top flange at the line of restraint, Δ_{tf}, shall be calculated at factored load levels for LRFD and nominal load levels for ASD and shall be limited to:

$$\Delta_{tf} \leq \frac{1}{\Omega} \cdot \frac{d}{20} \text{ (ASD)} \quad \text{or} \qquad (Eq.\ D3.2.1\text{-}9a)$$

$$\Delta_{tf} \leq \phi \cdot \frac{d}{20} \text{ (LRFD, LSD)} \qquad (Eq.\ D3.2.1\text{-}9b)$$

USA and Mexico		Canada
Ω(ASD)	ϕ (LRFD)	ϕ (LSD)
2.0	0.75	0.70

Table D3.2.1-1
Support Restraints

			C1	C2	C3	C4	C5	C6
Simple Span	Through Fastened (TF)		0.5	8.2	33	0.99	0.43	0.17
	Standing Seam (SS)		0.5	8.3	28	0.61	0.29	0.051
Multiple Spans	TF	Exterior Frame Line*	0.5	14	6.9	0.94	0.073	0.085
		First Interior Frame Line	1.0	4.2	18	0.99	2.5	0.43
		All Other Locations	1.0	6.8	23	0.99	1.8	0.36
	SS	Exterior Frame Line*	0.5	1.3	11	0.35	2.4	0.25
		First Interior Frame Line	1.0	1.7	69	0.77	1.6	0.13
		All Other Locations	1.0	4.3	55	0.71	1.4	0.17

Table D3.2.1-2
Mid-Point Restraints

			C1	C2	C3	C4	C5	C6
Simple Span	Through Fastened (TF)		1.0	7.6	44	0.96	0.75	0.42
	Standing Seam (SS)		1.0	7.5	15	0.62	0.35	0.18
Multiple Spans	TF	End Bay*	1.0	8.3	47	0.95	3.1	0.33
		First Interior Bay	1.0	3.6	53	0.92	3.9	0.36
		All Other Locations	1.0	5.4	46	0.93	3.1	0.31
	SS	End Bay*	1.0	7.9	19	0.54	2.0	0.080
		First Interior Bay	1.0	2.5	41	0.47	2.6	0.13
		All Other Locations	1.0	4.1	31	0.46	2.7	0.15

Table D3.2.1-3
One-Third Point Restraints

			C1	C2	C3	C4	C5	C6
Simple Span	Through Fastened (TF)		0.5	7.8	42	0.98	0.39	0.40
	Standing Seam (SS)		0.5	7.3	21	0.73	0.19	0.18
Multiple Spans	TF	End Bay Exterior Anchor*	0.5	15	17	0.98	0.72	0.043
		End Bay Int. Anchor and 1st Int. Bay Ext. Anchor	0.5	2.4	50	0.96	0.82	0.20
		All Other Locations	0.5	6.1	41	0.96	0.69	0.12
	SS	End Bay Exterior Anchor*	0.5	13	13	0.72	0.59	0.035
		End Bay Int. Anchor and 1st Int. Bay Ext. Anchor	0.5	0.84	56	0.64	0.20	0.14
		All Other Locations	0.5	3.8	45	0.65	0.10	0.014

Note:

* For multi-span systems, the force P_i in Equation D3.2.1-2 for the "Exterior Frame Line", "End Bay", or "End Bay Exterior Anchor" cases shall not be taken as less than 80% of the force determined using the coefficients C2, C3 & C4 for the "All Other Locations" case

COMMENTARY

D3.2.1 Anchorage of Bracing for Purlin Roof Systems Under Gravity Load with Top Flange Connected to Metal Sheathing

In metal roof systems utilizing C- or Z-purlins, the application of gravity loads will cause torsion in the purlin and lateral displacements of the roof system. These effects are due to the slope of the roof, the loading of the member eccentric to its shear center, and for Z-purlins, the inclination of the principal axes. The torsional effects are not accounted for in the design provisions of Section C3.1, and lateral displacements may create instability in the system. Lateral restraint is typically provided by the roof sheathing and lateral anchorage devices to minimize the lateral movement and the torsional effects. The anchorage devices are designed to resist the lateral anchorage force and provide the appropriate level of stiffness to ensure the overall stability of the purlins.

The calculation procedure in Equations D3.2.1-1 through D3.2.1-6 determines the anchorage force by first calculating an upper bound force for each purlin, P_i, at the line of anchorage. This upper bound force is then distributed to anchorage devices and reduced due to the system stiffness based on the relative effective stiffness of each component. For the calculation procedure, the anchorage devices are modeled as linear springs located at the top of the purlin web. The stiffness of anchorage devices that do not attach at this location must be adjusted, through analysis or testing, to an equivalent lateral stiffness at the top of the web. This adjustment must include the influence of the attached purlin but not include any reduction due to the flexibility of the sheathing to purlin connection. Equation D3.2.1-5 establishes an effective lateral stiffness for each anchorage device, relative to each purlin, that has been adjusted for the flexibility of the roof system between the purlin location and the anchorage location. It is important to note that the units of A_p are area per unit width. Therefore the bay length, L, in this equation must have units consistent with the unit width used for establishing A_p. The resulting product, LA_p, has units of area. The total effective stiffness for a given purlin is then calculated with Equation D3.2.1-3 by summing the effective stiffness relative to each anchorage device and the system stiffness from Equation D3.2.1-4. The force generated by an individual purlin is calculated by Equation D3.2.1-2, and then distributed to an anchorage device based on the relative stiffness ratio in Equation D3.2.1-1.

Lateral bracing forces will accumulate within the roof sheathing, and must be transferred into the anchorage devices. The strength of the elements in this load path must be verified. AISI TS-12, Test Proceedures for Determining a Strength Value for a Roof Panel-to-Purlin-to-Anchorage Device Connection, provides a means to determine a lower bound strength for the complete load path. For through-fastened roof systems, this strength value can be reasonably estimated by rational analysis by assuming that the roof fasteners within twelve inches of the anchorage device participate in the force transfer.

The 1986 through 2001 Specifications included brace force equations that were based on the work by Murray and Elhouar (1985) with various extensions from subsequent work. The original work assumed the applied loading was parallel to the purlin webs. The later addition of the "cos θ" and "sin θ" terms attempted to account for the roof slope but it failed to correctly model the system effect for higher sloped roofs. Tests by Lee and Murray (2001) and Seek and Murray (2004) showed generally that the brace force equations conservatively predicted the lateral anchorage forces at slopes less than 1:12 but

predicted unconservative lateral anchorage forces at steeper slopes. The new procedure outlined in Section D3.2.1 was formulated to correlate better with test results. Also, the original work was based on the application of one anchorage device to a group of purlins. Until the work of Sears and Murray (2007) a generally accepted manual technique to extend this procedure to roofs with multiple anchors was not available.

Prior to the work by Seek and Murray (2006, 2007) and Sears and Murray (2007), the anchorage devices were assumed to have a constant and relatively high lateral stiffness. The current provisions recognize the finite stiffness of the anchorage device, and the corresponding decrease in anchorage forces for more flexible anchorage devices. Equation D3.2.1-7 establishes a minimum effective stiffness that must be provided to limit the lateral displacement at the anchorage device to d/20. This required stiffness does not represent the required stiffness of each anchorage device, but instead the total stiffness provided by the stiffness of the purlin system (K_{sys}) and the anchorage devices relative to the most remote purlin.

Several alternative rational analysis methods have been developed to predict lateral anchorage forces for Z-section roof systems. A method for calculating lateral anchorage forces is presented by Seek and Murray (2006, 2007). The method is similar to the procedure outlined in Section D3.2.1 but uses a more complex method derived from mechanics to determine the lateral force introduced into the system at each Z-section, P_i, and distributes the force to the components of the system according to the relative lateral stiffness of each of the components. The method is more computationally intensive but allows for analysis of more complex bracing configurations such as supports plus third points lateral anchorage and supports plus third points torsional braces.

A method to predict lateral anchorage forces using the finite element method is presented in Seek and Murray (2004). The model uses shell finite elements to model the Z-sections and sheathing in the roof system. The model accurately represents Z-section behavior and is capable of handling configurations other than lateral anchorage applied at the top flange. However, the computational complexity limits the size of the roof system that can be modeled by this method.

Rational analysis may also be performed using the elastic stiffness model developed by Sears and Murray (2007) upon which the provisions of Section D3.2.1 are based. The model uses frame finite elements to represent the Z-sections and a truss system to represent the diaphragm. The model is computationally efficient allowing for analysis of large systems.

VITA

Jeffrey Michael Sears was born on April 13, 1978 in El Reno, Oklahoma. He received a Bachelor of Science degree in civil engineering from the University of Oklahoma in December 2000. He worked as a structural engineer for Star Building Systems in Oklahoma City, Oklahoma starting in January 2001 and is licensed as a civil engineer in the state of California. Jeff began graduate studies at Virginia Polytechnic Institute and State University (Virginia Tech) in August 2005 and continued to work for Star. The author received a Master of Science degree in structural engineering from Virginia Tech in spring 2007 and now works for Kirkpatrick, Forest and Curtis in Oklahoma City where he lives with his wife Vicki, and two young daughters.