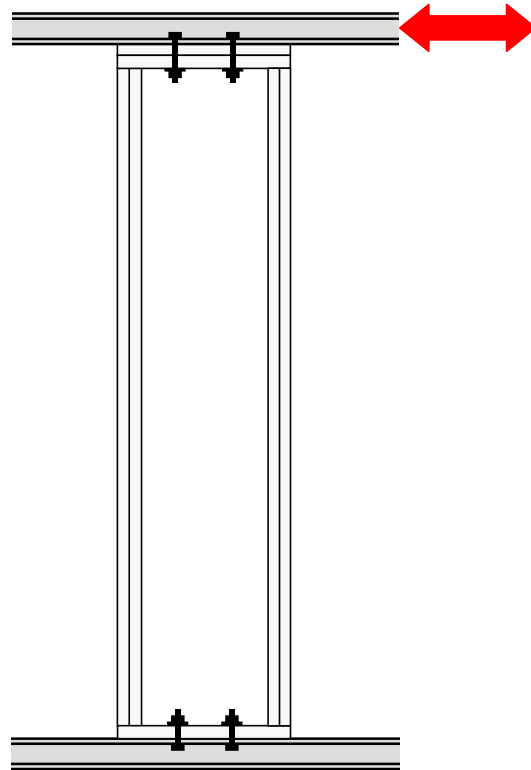


Walls 02IAc



Walls:	02IAc1	02IAc1re	02IAc2	02IAc2r
Manufactured:	July 1, 1998	July 1, 1998	July 1, 1998³	July 1, 1998
MOE data files:	2iac1s.prn	2iac1s.prn	2iac2s.prn	2iac2s.prn
MOE _{plates} (10 ⁶ psi)				
MOE _{studs} (10 ⁶ psi)	1.65	1.65	1.56	1.56
Density _{plates} (kg/m ³)				
Density _{studs} (kg/m ³)	471	471	514	514
Date tested:	August 2, 1998¹	August 3, 1998²	August 5, 1998	August 5, 1998⁴
Time tested:	18:42	10:12	9:19	10:16
LTC files:				
Data files:	02IAc1.dat	02IAc1re.dat	02IAc2.dat	02IAc2r.dat
Excel files:	02IAc1_data 02IAc1_UTP	02IAc1re_data 02IAc1re_UTP	02IAc2_data 02IAc2_UTP	02IAc2r_data 02IAc2r_UTP
Photo files:	718-723	724-728	774-776	

- ¹ Sheathing was reattached to the bottom plate with $\frac{3}{4}$ -in. edge distance before the test.
- ² After the test of 02IAc1 wall, the sheathing was attached to the bottom plate at 3 in. o. c. with $\frac{3}{4}$ -in. edge distance.
- ³ Sheathing was attached to the bottom plate with the average $\frac{1}{2}$ -in. edge distance.
- ⁴ After the test of 02IAc2 wall, the sheathing was attached to the bottom plate at 6 in. o. c. with $\frac{1}{2}$ to $\frac{3}{4}$ -in. edge distance.

Wall 02IAc1

Observations: The wall exhibited extremely 'soft' performance: the shear modulus 1.75 Kip/in., which was approximately a half of 02IAM2 wall. The sheathing almost did not move relative to the studs or the top plate as the graphs show. The uplift displacement of studs was symmetrical. The wall started yielding at approximately 0.5 in. The average peak load 0.19 Kips (0.10 Kip/ft.) was reached between 1.8 and 2.1-in. amplitudes. There was no visible strength degradation until 3.4-in amplitude.

Failure mode: Sheathing unzipped at the bottom plate while the rest of the wall remained intact. The nails pulled their heads through sheathing (Photos 718, 720).

Wall 02IAc1re

Rationale: After the test of wall 02IAc1, the wall remained intact except for the bottom plate and unzipped sheathing at the bottom. It was intended to test the performance of a wall repaired after a seismic event. A new bottom plate was installed and sheathing nails were driven along the bottom at 3 in. o. c. with $\frac{3}{4}$ -in. edge distance.

Observations: There was a dramatic improvement in the wall performance relative to the first test. The wall was considerably (2.6 times) stiffer and more than 60% stronger than 02IAc1 wall. The average yield load 0.28 Kips (0.14 Kip/ft.) was sustained beginning at approximately 0.5-in. deflection. Significant strength degradation started after 2.7-in. amplitude. The sheathing did not move relative to the studs or top plate as graphs show.

Failure mode: The sheathing unzipped from the bottom plate and the rest of the wall 'walked' away from the foundation as a rigid body. Most of sheathing nails pulled heads through and some tore through the edge at the bottom (Photos 725, 728).

Wall 02IAc2

Observations: This wall performed similarly to 02IAc1 wall: the average yield load 0.2 Kips (0.10-Kip/ft.) was sustained between 0.5 and 2.4-in. amplitudes. During the next phase, the sheathing started unzipping along the bottom plate.

Failure mode: Typical for IAc walls: sheathing unzipped along the bottom. Nail tore through the sheathing edge. No nail fatigue.

Wall 02IAc2re

Observations: Relative to 02IAc2 wall, the performance parameters of this wall improved likely due to fresh nailing and larger edge distance. The elastic stiffness was 18% higher, the peak load was 40% higher. However, the accuracy of readings was not sufficient for considering these comparisons reliable. In general, the wall performed similarly to 02IAc2 wall. The yield load was sustained between 1.5 and 2.4 in. The 20% resistance decrease was observed between 2.8 and 3-in. amplitudes.

Failure mode: The sheathing unzipped at the bottom plate similar to the previous walls.

General

Data acquisition: The load range at the UTP controller was set at 5500 lbf. However, due to the low load capacity of the specimens, the errors in the load readings were relatively high.

Table 02IAc1. Data summary.

Specimen		02IAc1	Per unit length	
Shear Bolts		cyclic test		
Wall length		2.00ft.	0.609m	
Date:	8-02-1998	Time:	18:42	
EEEP Parameters		units	initial	stabilized
Peak unit load, v_{peak}	Kip/ft.	0.095	0.083	
	KN/m	1.379	1.215	
Drift at peak load, Δ_{peak}	in.	1.961	1.658	
	mm	49.82	42.12	
Yield unit load, v_{yield}	Kip/ft.	0.082	0.075	
	KN/m	1.201	1.092	
Drift at yield load, Δ_{yield}	in.	0.420	0.496	
	mm	10.66	12.59	
Proportional limit, $0.4v_{peak}$	Kip/ft.	0.038	0.033	
	KN/m	0.552	0.486	
Drift at prop. limit, $\Delta@0.4v_{peak}$	in.	0.192	0.220	
	mm	4.88	5.60	
Unit load at failure or $0.8v_{peak}$	Kip/ft.	0.076	0.067	
	KN/m	1.103	0.972	
Drift at failure, $\Delta_{failure}$	in.	3.402	3.264	
	mm	86.40	82.91	
Shear modulus, G $@0.4v_{peak}$	Kip/in.	1.755	1.225	
	KN/mm	0.307	0.215	
Work until failure per unit length	Kip-ft./ft.	0.682	0.648	
	KN-m/m	3.035	2.882	
Unit load, $v_{1/300}$ $@ 0.32$ in. (8.13 mm)	Kips/ft.	0.047	0.047	
	KN/m	0.691	0.690	
Unit load, $v_{1/200}$ $@ 0.48$ in. (12.19 mm)	Kips/ft.	0.057	0.056	
	KN/m	0.832	0.815	
Unit load, $v_{1/100}$ $@ 0.96$ in. (24.38 mm)	Kips/ft.	0.077	0.073	
	KN/m	1.125	1.070	
Unit load, $v_{1/60}$ $@ 1.6$ in. (40.64 mm)	Kips/ft.	0.091	0.082	
	KN/m	1.327	1.198	
EVDR $@v_{peak}$			0.214	0.214

SEAOSC parameters		units	negative	positive	average
Yield Limit State	v_{YLS}	Kips/ft.	-0.067	0.075	0.071
		KN/m	-0.978	1.094	1.036
	Δ_{YLS}	in.	-0.609	0.905	0.757
		mm	-15.48	22.99	19.24
Strength Limit State	G'_{YLS}	Kip/in.	0.880	0.663	0.750
		KN/mm	0.154	0.116	0.131
	v_{SLS}	Kips/ft.	-0.089	0.101	0.095
		KN/m	-1.291	1.467	1.379
Δ_{SLS}	in.	-1.816	2.106	1.961	
	mm	-46.14	53.50	49.82	
G'_{SLS}	Kip/in.	0.390	0.382	0.385	
	KN/mm	0.068	0.067	0.067	

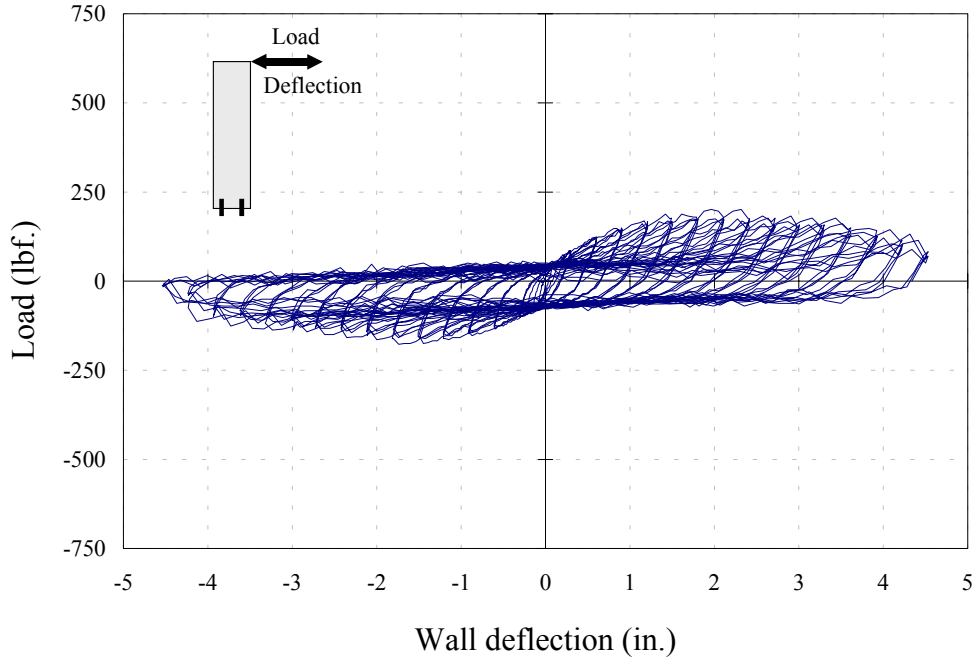


Figure 02IAC1- a. Observed load-deflection curve¹.

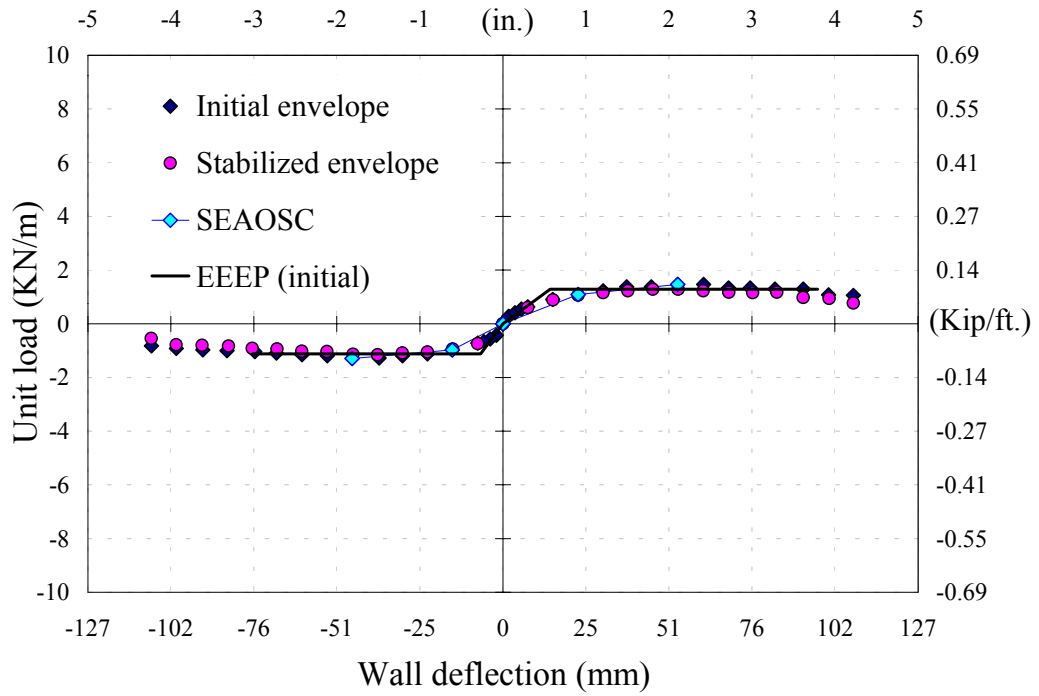


Figure 02IAC1- b. Envelopes, SEAOSC, and EEEP curves².

¹ The scale of the graph varies between test series.

² The scale of the graph is uniform between test series for comparison purposes.

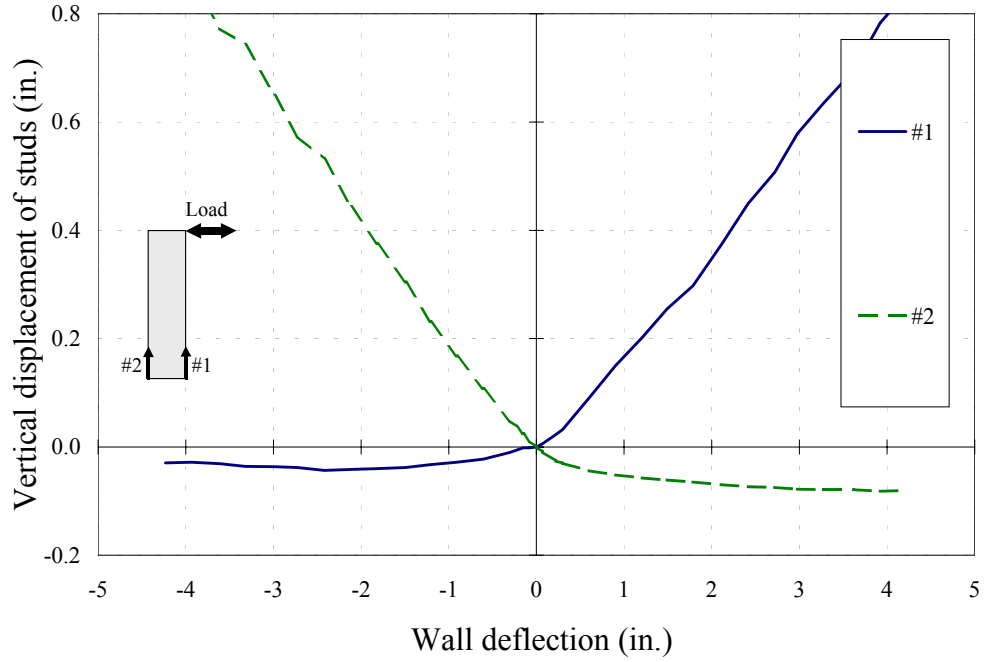


Figure 02IAc1- c. Vertical displacement of studs (initial envelope).

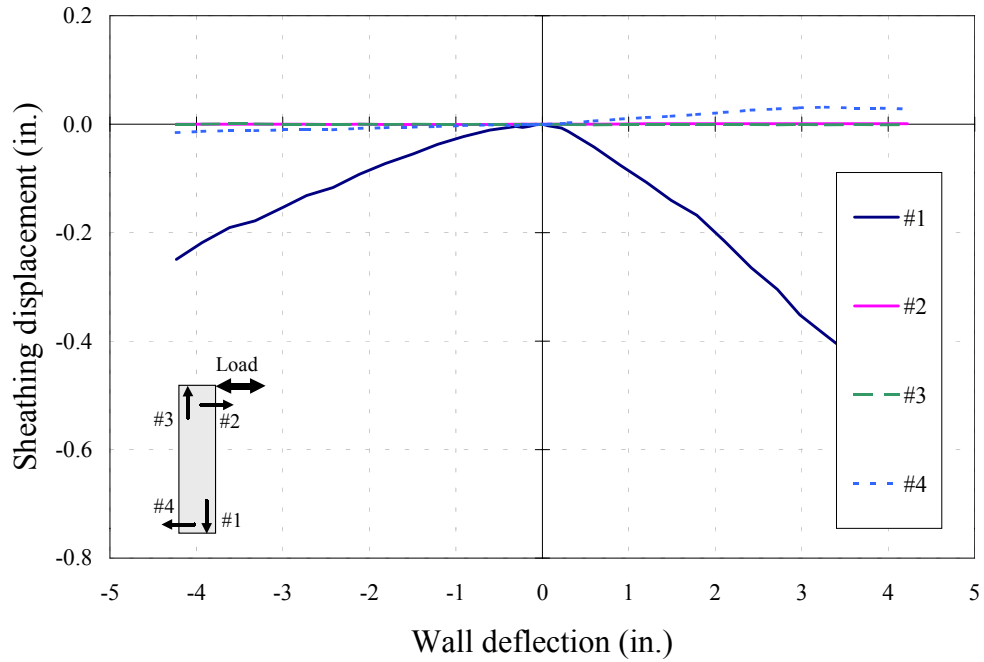


Figure 02IAc1- d. Sheathing displacement (initial envelope).

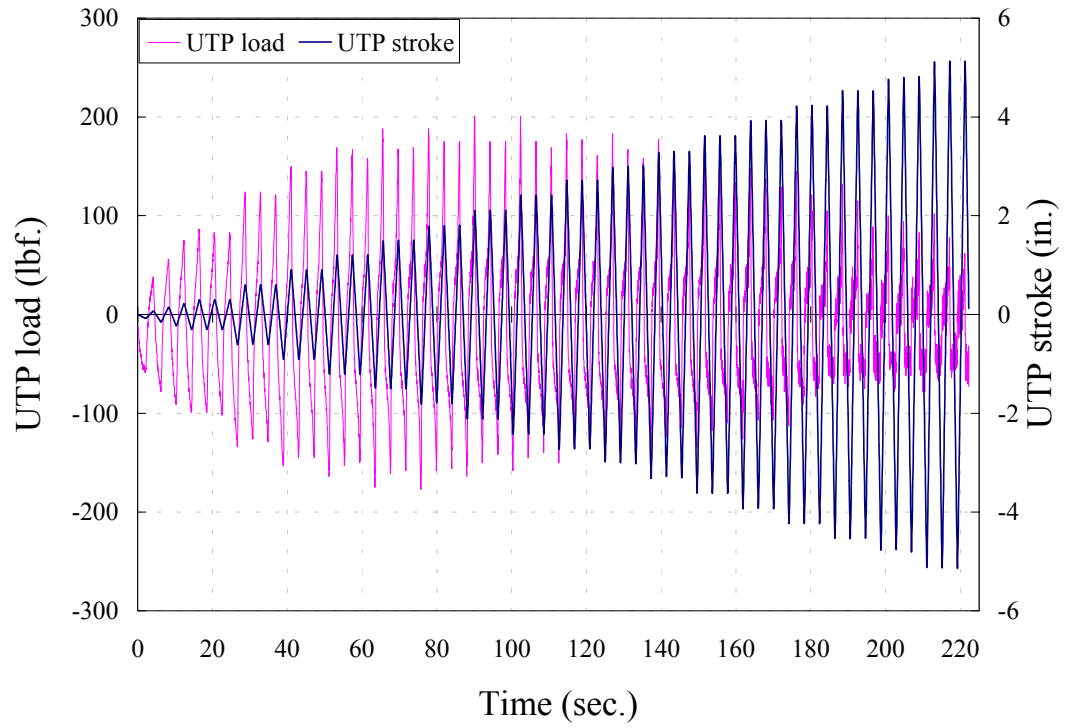


Figure 02IAC1- f. Load- and displacement-time record.

Table 02IAc1re. Data summary.

Specimen		02IAc1re	Per unit length	
Shear Bolts		cyclic test		
Wall length		2.00ft.	0.609m	
Date:	8-03-1998	Time:	10:12	
EEEP Parameters		units	initial	stabilized
Peak unit load, v_{peak}	Kip/ft.	0.155	0.137	
	KN/m	2.266	1.999	
Drift at peak load, Δ_{peak}	in.	1.349	1.209	
	mm	34.27	30.70	
Yield unit load, v_{yield}	Kip/ft.	0.140	0.126	
	KN/m	2.040	1.841	
Drift at yield load, Δ_{yield}	in.	0.242	0.390	
	mm	6.15	9.92	
Proportional limit, $0.4v_{peak}$	Kip/ft.	0.062	0.055	
	KN/m	0.906	0.800	
Drift at prop. limit, $\Delta@0.4v_{peak}$	in.	0.107	0.170	
	mm	2.73	4.31	
Unit load at failure or $0.8v_{peak}$	Kip/ft.	0.124	0.110	
	KN/m	1.812	1.599	
Drift at failure, $\Delta_{failure}$	in.	2.848	2.632	
	mm	72.34	66.85	
Shear modulus, G $@0.4v_{peak}$	Kip/in.	4.654	2.585	
	KN/mm	0.815	0.453	
Work until failure per unit length	Kip-ft./ft.	0.628	0.706	
	KN-m/m	2.792	3.141	
Unit load, $v_{1/300}$ $@ 0.32$ in. (8.13 mm)	Kips/ft.	0.100	0.099	
	KN/m	1.461	1.445	
Unit load, $v_{1/200}$ $@ 0.48$ in. (12.19 mm)	Kips/ft.	0.118	0.113	
	KN/m	1.723	1.645	
Unit load, $v_{1/100}$ $@ 0.96$ in. (24.38 mm)	Kips/ft.	0.148	0.133	
	KN/m	2.156	1.936	
Unit load, $v_{1/60}$ $@ 1.6$ in. (40.64 mm)	Kips/ft.	0.152	0.132	
	KN/m	2.219	1.926	
EVDR $@v_{peak}$			0.203	0.201

SEAOSC parameters		units	negative	positive	average
Yield Limit State	v_{YLS}	Kips/ft.	-0.100	0.097	0.098
		KN/m	-1.452	1.408	1.430
	Δ_{YLS}	in.	-0.305	0.296	0.300
		mm	-7.74	7.52	7.63
Strength Limit State	G'_{YLS}	Kip/in.	2.612	2.609	2.611
		KN/mm	0.457	0.457	0.457
	v_{SLS}	Kips/ft.	-0.160	0.150	0.155
KN/m		-2.335	2.196	2.266	
Δ_{SLS}	in.	-1.494	1.204	1.349	
	mm	-37.95	30.58	34.27	
G'_{SLS}	Kip/in.	0.857	1.000	0.921	
	KN/mm	0.150	0.175	0.161	

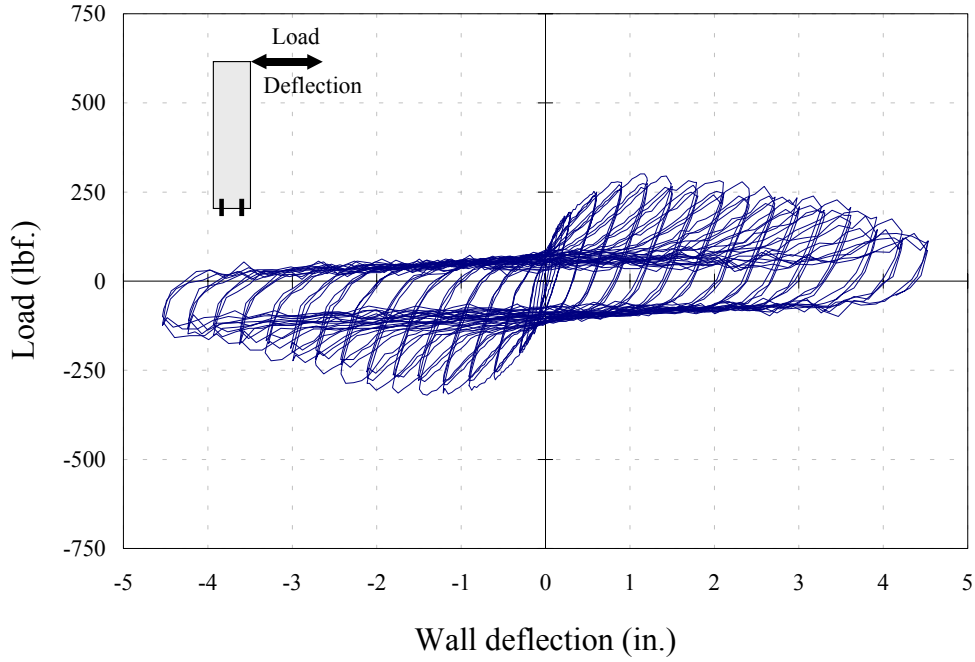


Figure 02IAC1re- a. Observed load-deflection curve.

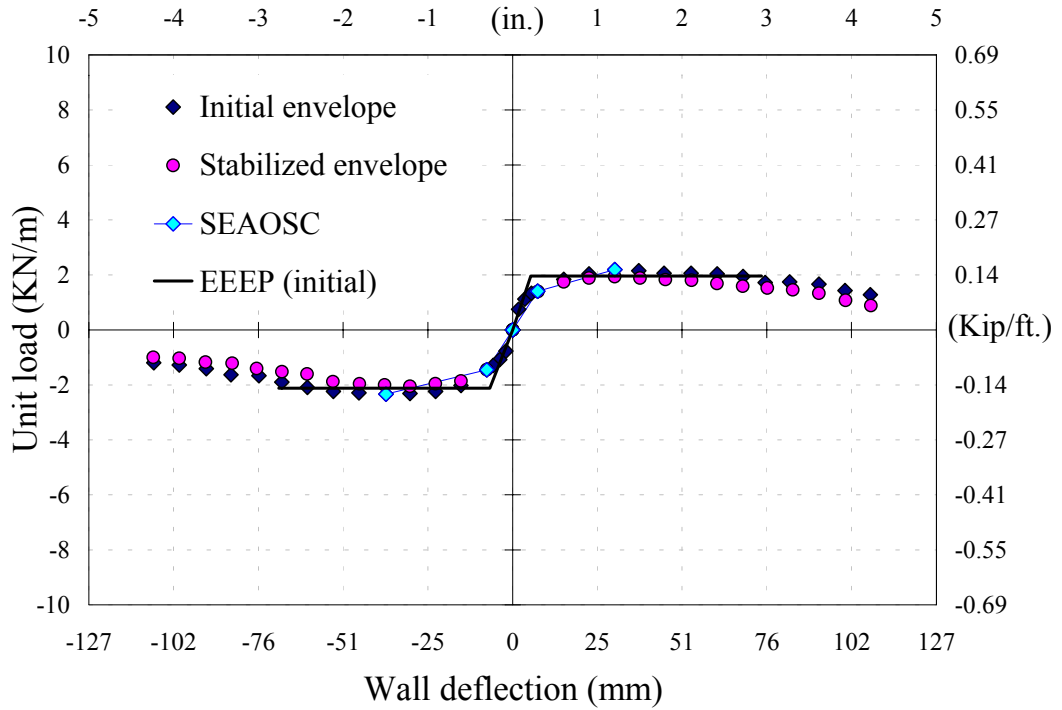


Figure 02IAC1re- b. Envelopes, SEAOSC, and EEEP curves.

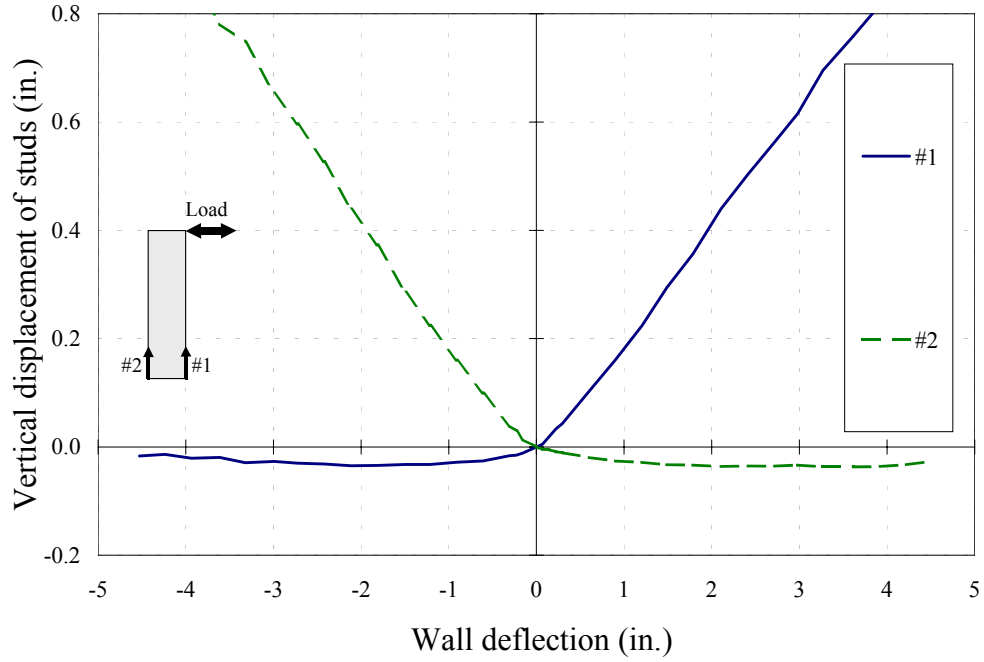


Figure 02IAc1re- c. Vertical displacement of studs (initial envelope).

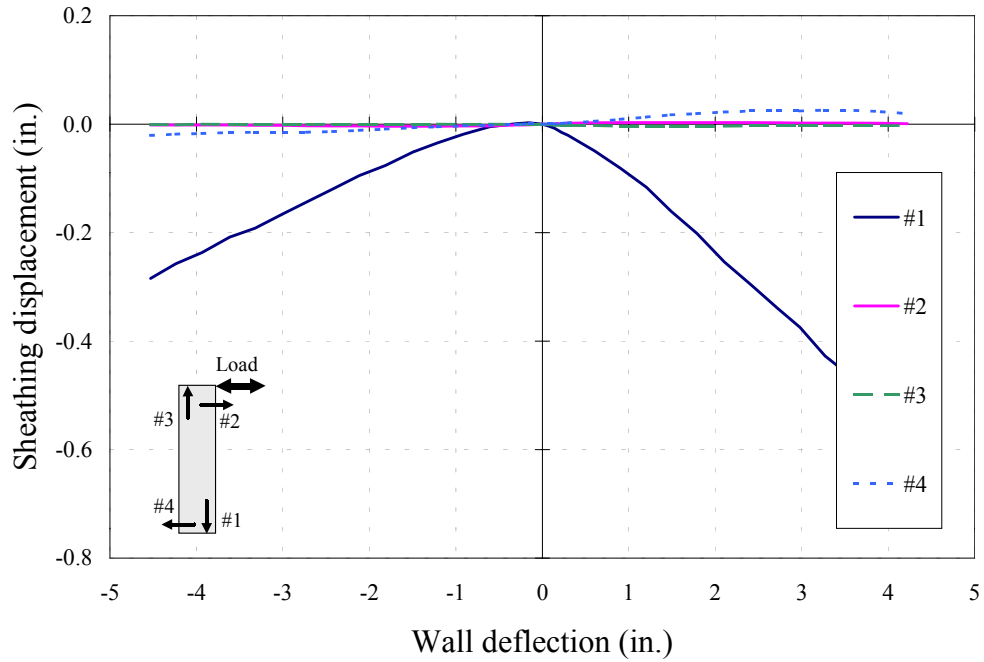


Figure 02IAc1re- d. Sheathing displacement (initial envelope).

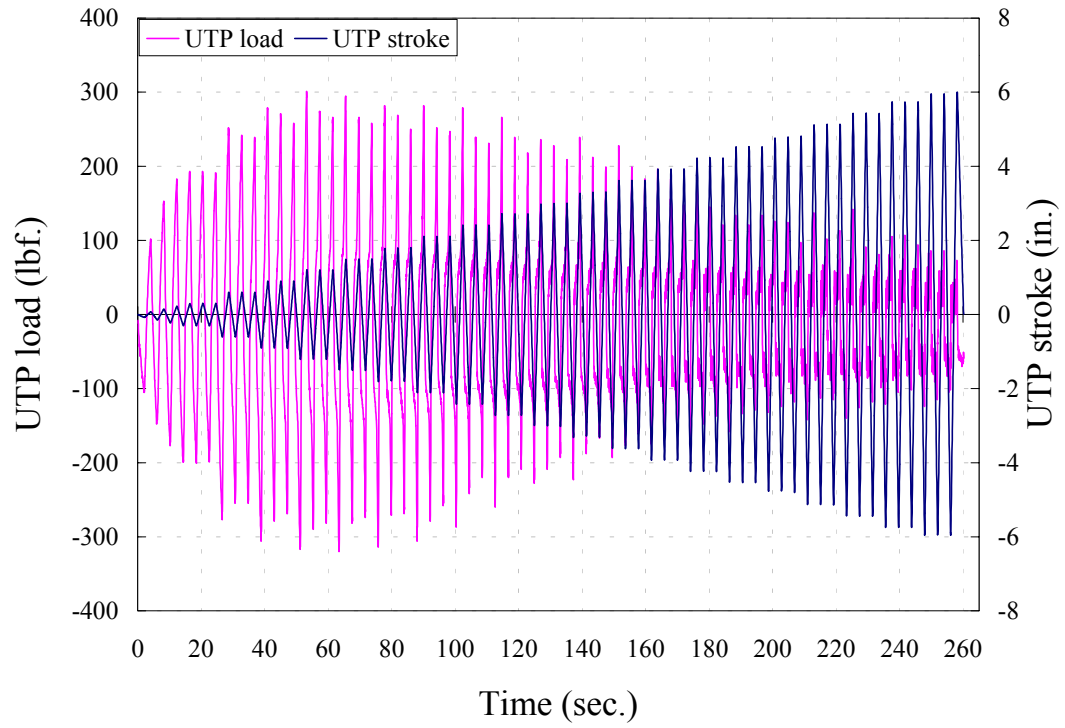


Figure 02IAc1re- f. Load- and displacement-time record.

Table 02IAc2. Data summary.

Specimen		02IAc2	Per unit length	
Shear Bolts			cyclic test	
Wall length			2.00ft.	0.609m
Date:	8-05-1998	Time:	9:19	
EEEP Parameters		units	initial	stabilized
Peak unit load, v_{peak}		Kip/ft.	0.103	0.091
		KN/m	1.499	1.332
Drift at peak load, Δ_{peak}		in.	1.654	1.507
		mm	42.01	38.29
Yield unit load, v_{yield}		Kip/ft.	0.092	0.083
		KN/m	1.337	1.214
Drift at yield load, Δ_{yield}		in.	0.324	0.444
		mm	8.23	11.28
Proportional limit, $0.4v_{peak}$		Kip/ft.	0.041	0.036
		KN/m	0.600	0.533
Drift at prop. limit, $\Delta@0.4v_{peak}$		in.	0.145	0.195
		mm	3.68	4.95
Unit load at failure or $0.8v_{peak}$		Kip/ft.	0.082	0.073
		KN/m	1.200	1.065
Drift at failure, $\Delta_{failure}$		in.	2.605	2.347
		mm	66.16	59.62
Shear modulus, G $@0.4v_{peak}$		Kip/in.	2.821	1.520
		KN/mm	0.494	0.266
Work until failure per unit length		Kip-ft./ft.	0.376	0.349
		KN-m/m	1.674	1.552
Unit load, $v_{1/300}$ $@ 0.32$ in. (8.13 mm)		Kips/ft.	0.060	0.058
		KN/m	0.874	0.852
Unit load, $v_{1/200}$ $@ 0.48$ in.(12.19 mm)		Kips/ft.	0.071	0.068
		KN/m	1.033	0.993
Unit load, $v_{1/100}$ $@ 0.96$ in. (24.38 mm)		Kips/ft.	0.092	0.084
		KN/m	1.339	1.230
Unit load, $v_{1/60}$ $@ 1.6$ in. (40.64 mm)		Kips/ft.	0.101	0.089
		KN/m	1.480	1.294
EVDR $@v_{peak}$			0.220	0.226

SEAOSC parameters		units	negative	positive	average
Yield Limit State	v_{YLS}	Kips/ft.	-0.070	0.089	0.079
		KN/m	-1.022	1.291	1.157
	Δ_{YLS}	in.	-0.609	0.601	0.605
		mm	-15.48	15.26	15.37
Strength Limit State	G'_{YLS}	Kip/in.	0.919	1.179	1.048
		KN/mm	0.161	0.206	0.184
	v_{SLS}	Kips/ft.	-0.097	0.109	0.103
		KN/m	-1.408	1.591	1.499
Δ_{SLS}	in.	-2.112	1.784	1.948	
	mm	-53.65	45.32	49.49	
G'_{SLS}	Kip/in.	0.365	0.489	0.422	
	KN/mm	0.064	0.086	0.074	

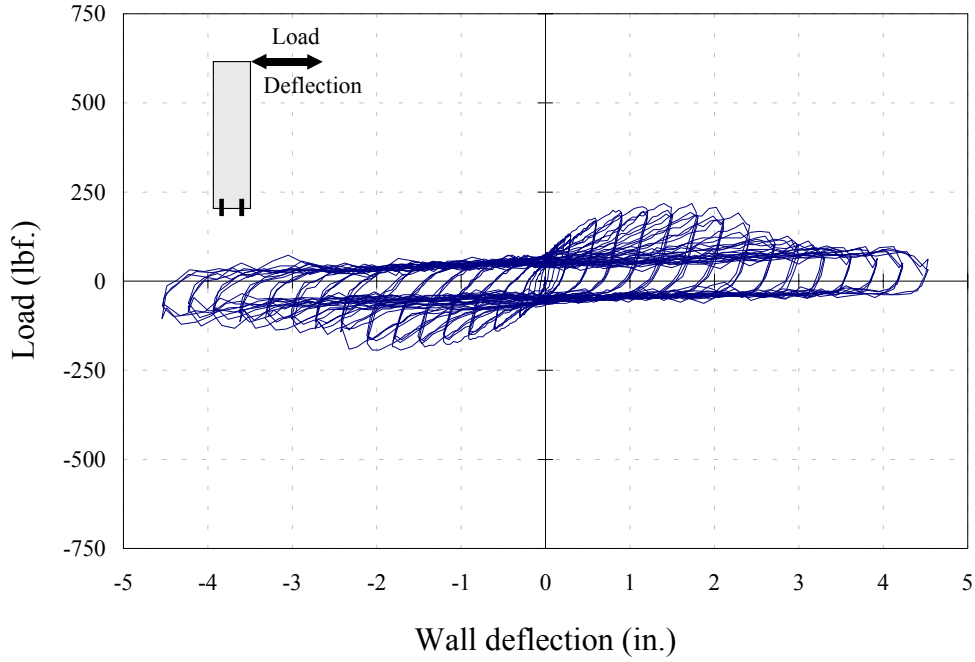


Figure 02IAC2- a. Observed load-deflection curve.

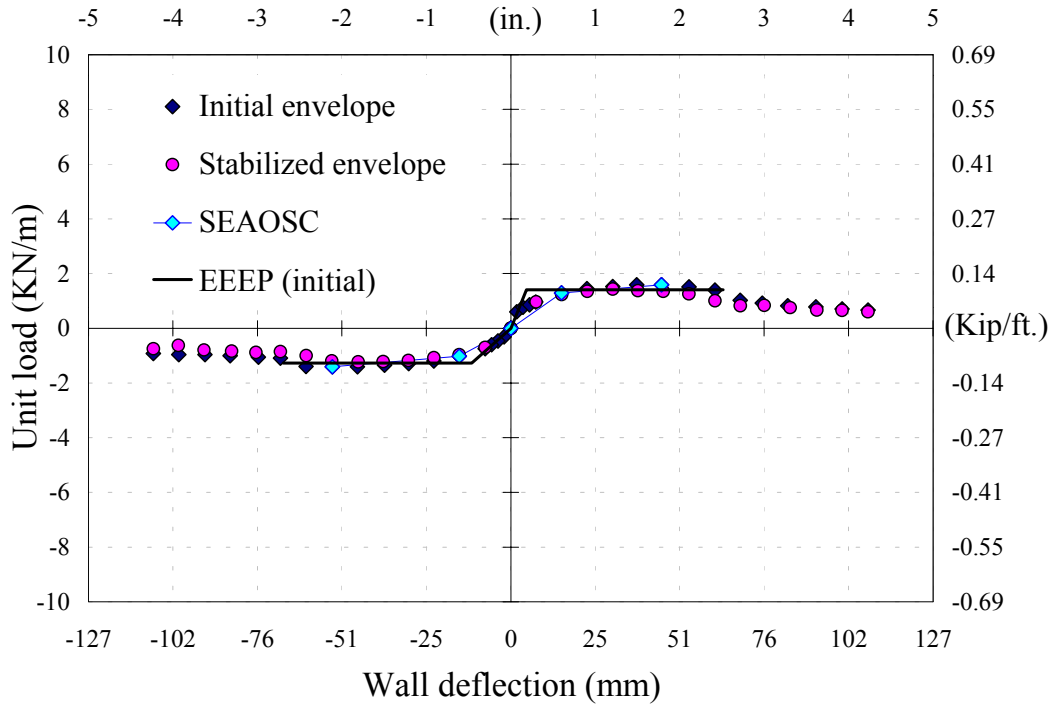


Figure 02IAC1- b. Envelopes, SEAOSC, and EEEP curves.

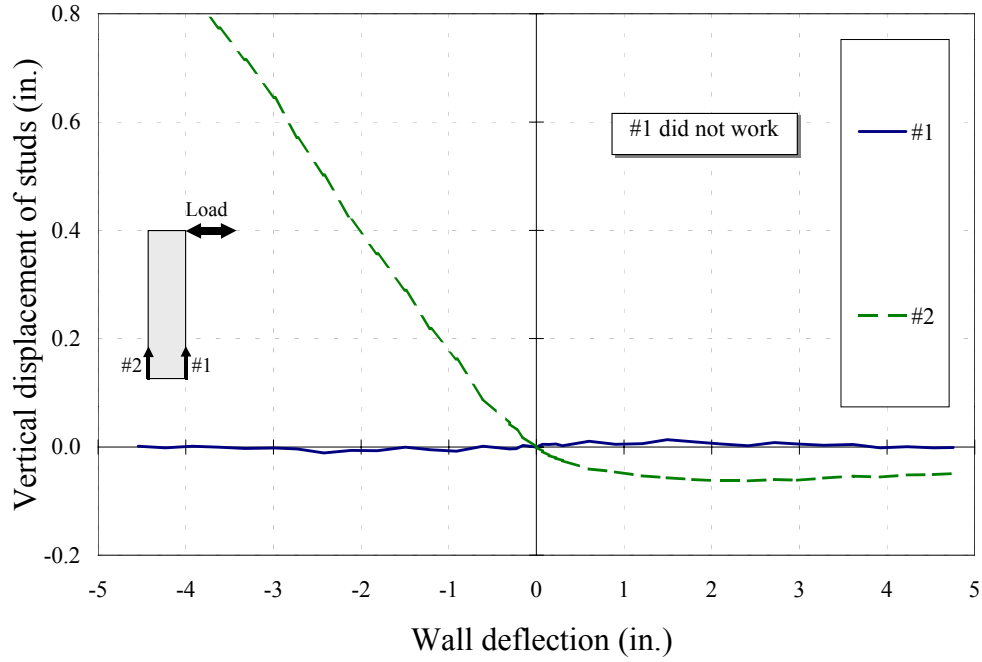


Figure 02IAc2- c. Vertical displacement of studs (initial envelope).

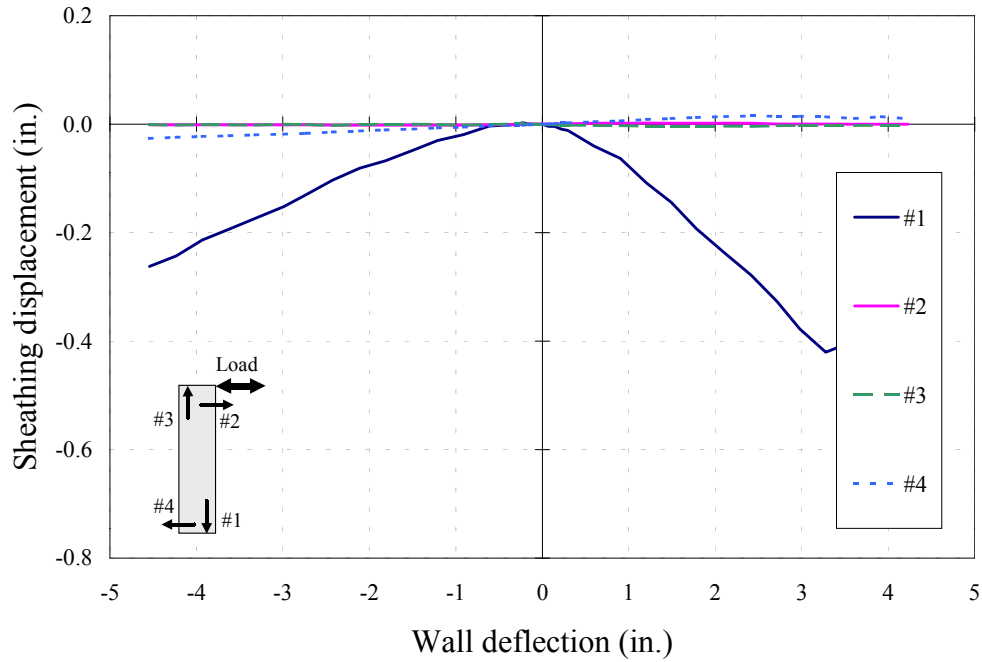


Figure 02IAc2- d. Sheathing displacement (initial envelope).

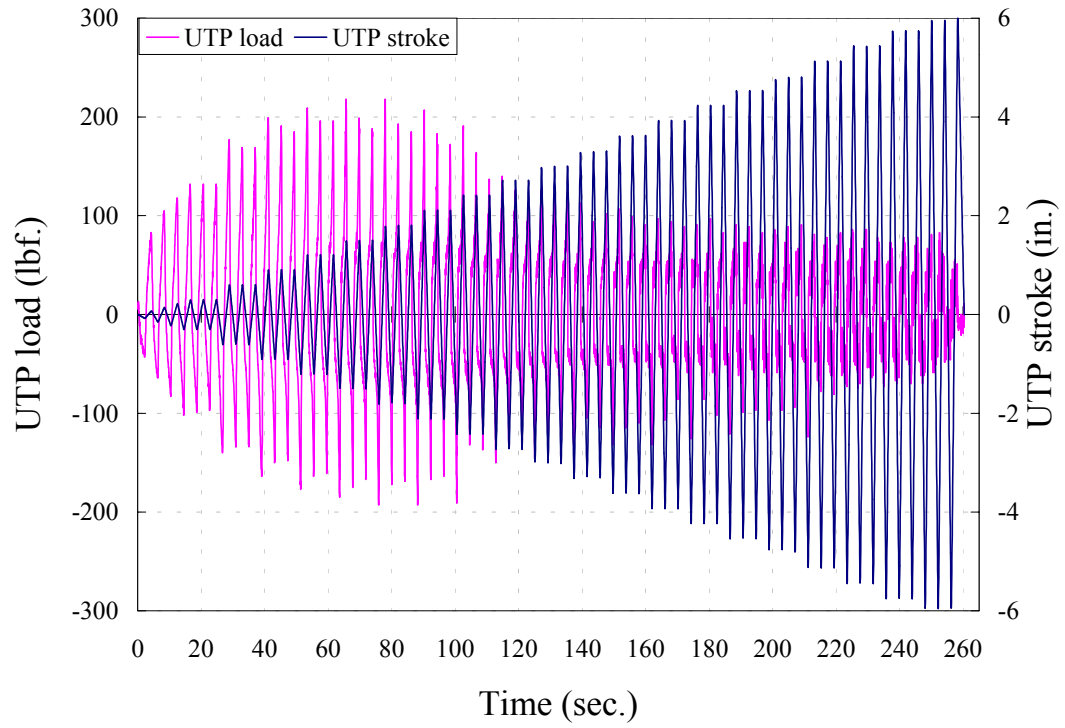


Figure 02IAc2- f. Load- and displacement-time record.

Table 02IAc2r. Data summary.

Specimen		02IAc2r	Per unit length	
Shear Bolts		cyclic test		
Wall length		2.00ft.	0.609m	
Date:	8-05-1998	Time:	10:16	
EEEP Parameters		units	initial	stabilized
Peak unit load, v_{peak}	Kip/ft.	0.128	0.114	
	KN/m	1.872	1.667	
Drift at peak load, Δ_{peak}	in.	1.956	1.663	
	mm	49.67	42.23	
Yield unit load, v_{yield}	Kip/ft.	0.115	0.106	
	KN/m	1.671	1.544	
Drift at yield load, Δ_{yield}	in.	0.290	0.392	
	mm	7.37	9.95	
Proportional limit, $0.4v_{peak}$	Kip/ft.	0.051	0.046	
	KN/m	0.749	0.667	
Drift at prop. limit, $\Delta@0.4v_{peak}$	in.	0.130	0.169	
	mm	3.30	4.30	
Unit load at failure or $0.8v_{peak}$	Kip/ft.	0.103	0.091	
	KN/m	1.497	1.334	
Drift at failure, $\Delta_{failure}$	in.	2.887	2.771	
	mm	73.32	70.37	
Shear modulus, G $@0.4v_{peak}$	Kip/in.	3.315	2.165	
	KN/mm	0.581	0.379	
Work until failure per unit length	Kip-ft./ft.	0.511	0.589	
	KN-m/m	2.273	2.621	
Unit load, $v_{1/300}$ $@ 0.32$ in. (8.13 mm)	Kips/ft.	0.079	0.082	
	KN/m	1.150	1.201	
Unit load, $v_{1/200}$ $@ 0.48$ in.(12.19 mm)	Kips/ft.	0.091	0.091	
	KN/m	1.333	1.329	
Unit load, $v_{1/100}$ $@ 0.96$ in. (24.38 mm)	Kips/ft.	0.116	0.108	
	KN/m	1.695	1.581	
Unit load, $v_{1/60}$ $@ 1.6$ in. (40.64 mm)	Kips/ft.	0.123	0.111	
	KN/m	1.797	1.614	
EVDR $@v_{peak}$			0.242	0.252

SEAOSC parameters		units	negative	positive	average
Yield Limit State	v_{YLS}	Kips/ft.	-0.101	0.102	0.101
		KN/m	-1.467	1.489	1.478
	Δ_{YLS}	in.	-0.609	0.604	0.606
		mm	-15.48	15.33	15.40
Strength Limit State	G'_{YLS}	Kip/in.	1.319	1.352	1.336
		KN/mm	0.231	0.237	0.234
	v_{SLS}	Kips/ft.	-0.135	0.121	0.128
KN/m		-1.977	1.766	1.872	
Δ_{SLS}	in.	-2.423	1.488	1.956	
	mm	-61.54	37.80	49.67	
G'_{SLS}	Kip/in.	0.447	0.650	0.525	
	KN/mm	0.078	0.114	0.092	

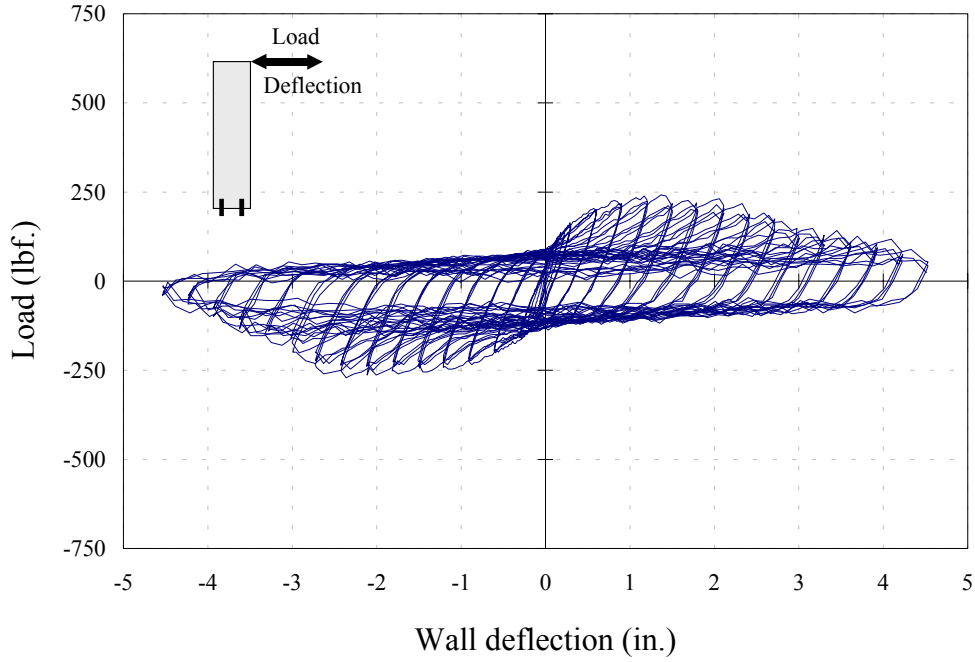


Figure 02IAc2r- a. Observed load-deflection curve.

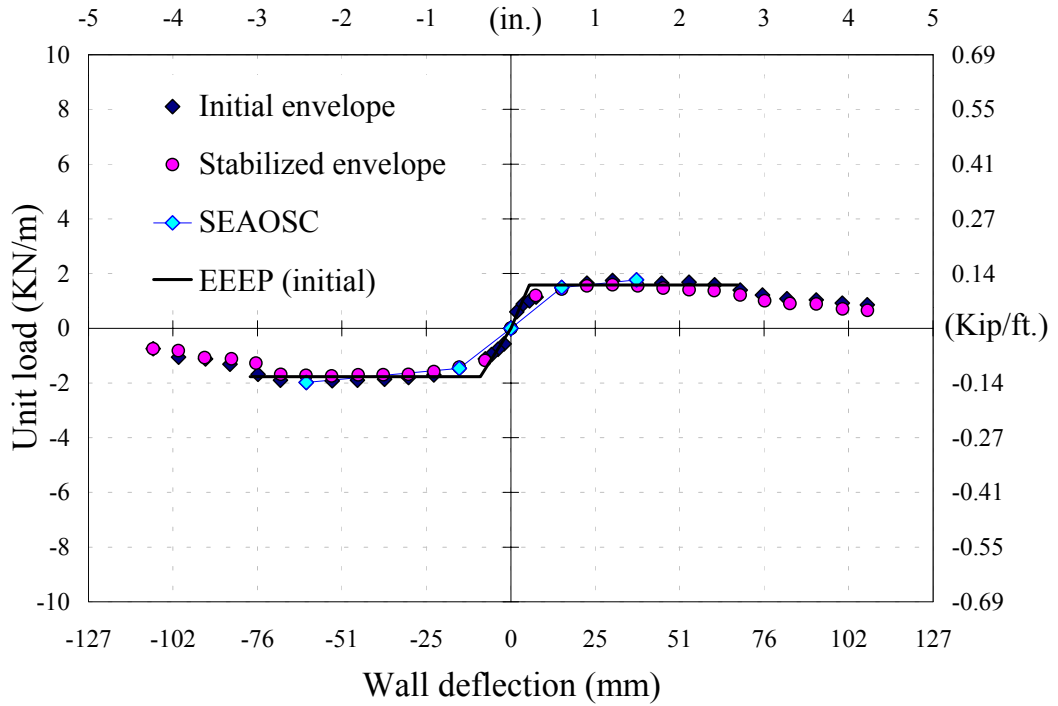


Figure 02IAc2r- b. Envelopes, SEAOSC, and EEEP curves.

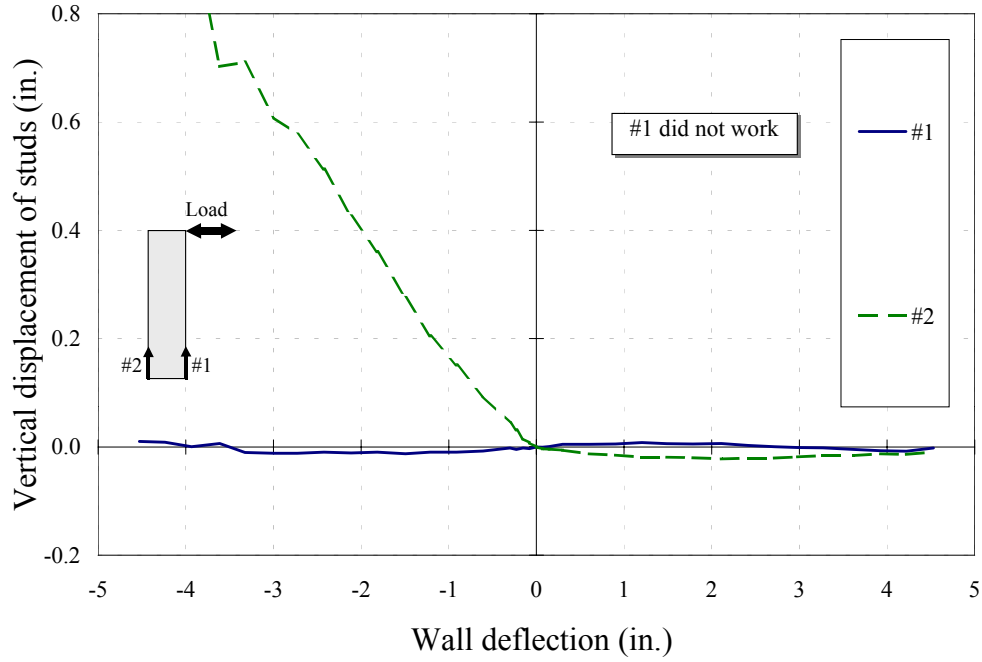


Figure 02IAc2r- c. Vertical displacement of studs (initial envelope).

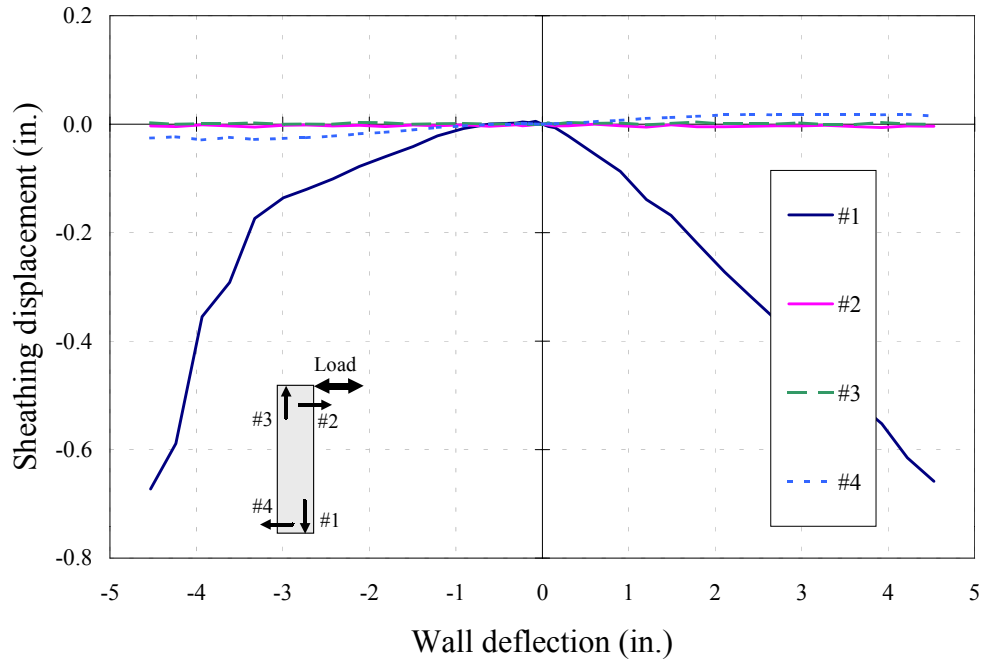


Figure 02IAc2r- d. Sheathing displacement (initial envelope).

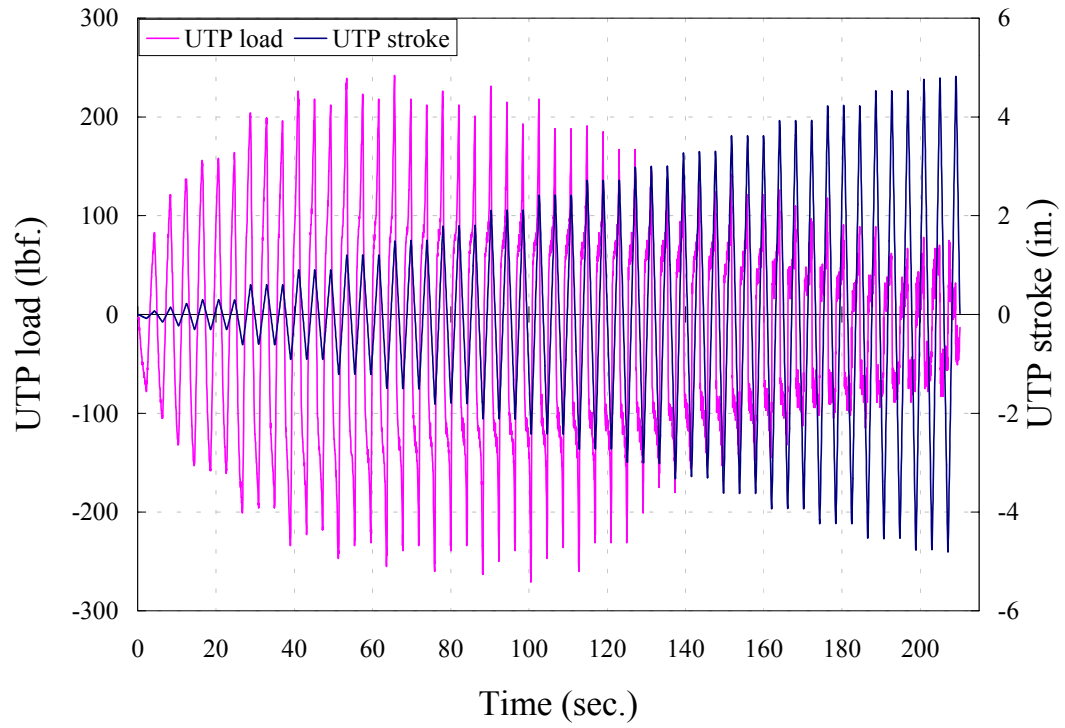


Figure 02IAc2r- f. Load- and displacement-time record.