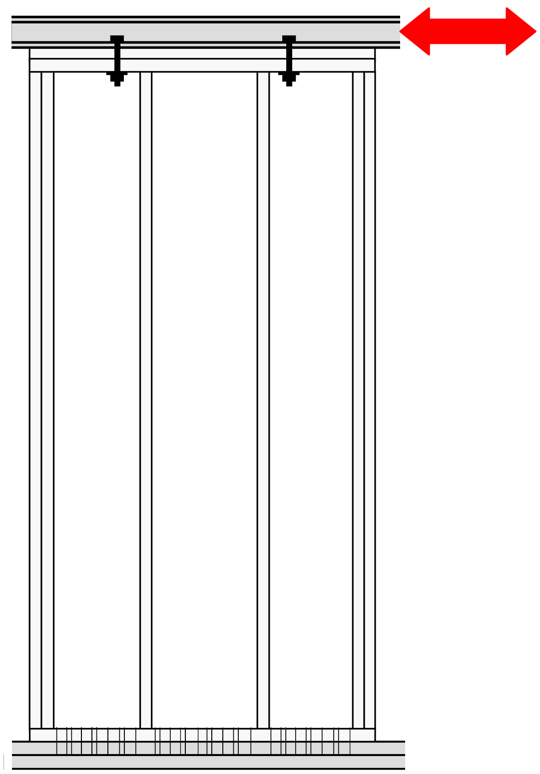
Walls 04NAc



Wall:	04NAc2	04NAc2r
Manufactured:	**June 21, 1998**	**June 21, 1998**
MOE data files:	4nac2s.prn	4nac2s.prn
MOE_{plates} (10^6 psi)		
MOE_{studs} (10^6 psi)	1.56	1.56
$Density_{plates}$ (kg/m^3)		
$Density_{studs}$ (kg/m^3)	503	503
Date tested:	**August 10, 1998**[1]	**August 10, 1998**[2]
Time tested:	17:55	19:11
LTC files:	alex_c4	alex_c4
Data files:	04NAc2.dat	04NAc2r.dat
Excel files:	04NAc2_data 04NAc2_UTP	04NAc2r_data 04NAc2r_UTP
Photo files:	814-815	816-817

1 The bottom plate was attached to the base with 3 rows of 16d nails at 3 in. o. c. one hour before the test. The sheathing was attached to with 3/8-in. edge distance.

2 The test was conducted on 04NAc2 wall. The sheathing was attached at 6 in. o. c. with ¾-in. edge distance. The bottom plate was replaced and attached to the base with 3 rows of 16d nails at 3 in. o. c. half hour before the test. The same base was used.

Wall 04NAc2

Observations: This wall was attached to the base with thirty-six 16d nails (three rows at 3 in. o. c.). The shear modulus was 50% higher than in corresponding 04IAc tests. The average peak load 632 lbf. 9(0.16 Kips./ft.) was reached at 1.2 in. deflection. Figure 04Nac2-a shows that the resistance on the positive stroke was undercut. A likely reason for that was the inadequate edge distance on the left side of the specimen (Photo815). Having reached the peak load, the wall rapidly degraded during the next phase (1.5 in.). Figures 04NAc2-c and 04Nac-d show that the wall rocked as a rigid body around the center.

Failure mode: The sheathing unzipped from the bottom plate (Photos 814, 815). Sheathing nails tore through the sheathing edge. The edge distance was 3/8 in. and less.

Wall 04NAc2r

Rationale: Wall 04NAc2 remained undamaged after the test except for the unzipped bottom. The specimen was manufactured with inadequate edge distance. The idea of the test was to estimate the cyclic performance of the wall with the properly attached sheathing. A new bottom plate as attached to the same specimen and the sheathing nails were spaced at 6 in. o. c. with ¾-in. edge distance. The bottom plate was attached to the base with thirty-six 16d nails (three rows at 3 in. o. c.).

Observations: This wall was 16% stiffer than 04NAc2 wall. Possible reason for that was the adequate and fresh nailing. The wall was not significantly stronger but it was very tough. The peak load developed at 1.2-in. amplitude was maintained during several phases (through 1.8-in. amplitude). The 20% load decrease occurred between 2.4 and 2.7-in. amplitudes. As can be seen from Figure 04NAm2r-d, most of the work was done by the nails at the bottom plate. Sheathing displacement relative to the studs and the top plate was negligible.

Failure mode: The sheathing separated from the bottom plate. Sheathing nails tore through the sheathing edge(Photos 816, 817).

General

Walls 04NAc performed significantly stiffer than the corresponding 04IAc walls. The stiff performance of walls 04NAc can be attributed to the fact that the bottom plate uniformly nailed to the base did not bend. During the IAc tests, the bottom plate was in bending as a console fixed to the base by the shear bolt and a washer at 24 in. from the wall end. On one hand, the bottom plate bending reduced the initial stiffness of the wall; on the other hand, it added the deformation capacity to the walls. It allowed distributing the forces between the sheathing nails along the bottom plate more uniformly.

Table 04Nac2. Data summary.

Specimen	**04Nac2**	**Per unit length**	
Nails		**cyclic test**	
Wall length		**4.00ft.**	**1.219m**
Date: 8-10-1998 **Time:**	17:55		
EEEP Parameters	**units**	**initial**	**stabilized**
Peak unit load, v_{peak}	Kip/ft. KN/m	0.158 2.308	0.139 2.027
Drift at peak load, Δ_{peak}	in. mm	1.209 30.70	1.059 26.90
Yield unit load, v_{yield}	Kip/ft. KN/m	0.136 1.982	0.125 1.819
Drift at yield load, Δ_{yield}	in. mm	0.278 7.07	0.414 10.52
Proportional limit, $0.4v_{peak}$	Kip/ft. KN/m	0.063 0.923	0.056 0.811
Drift at prop. limit, $\Delta@0.4v_{peak}$	in. mm	0.130 3.29	0.184 4.69
Unit load at failure or $0.8v_{peak}$	Kip/ft. KN/m	0.126 1.846	0.111 1.621
Drift at failure, $\Delta_{failure}$	in. mm	1.563 39.71	1.386 35.21
Shear modulus, G $@0.4v_{peak}$	Kip/in. KN/mm	3.947 0.691	2.412 0.422
Work until failure per unit length	Kip·ft./ft. KN·m/m	0.247 1.098	0.292 1.301
Unit load, $v_{1/300}$ @ 0.32 in. (8.13 mm)	Kips/ft. KN/m	0.095 1.384	0.093 1.358
Unit load, $v_{1/200}$ @ 0.48 in.(12.19 mm)	Kips/ft. KN/m	0.114 1.664	0.111 1.615
Unit load, $v_{1/100}$ @ 0.96 in. (24.38 mm)	Kips/ft. KN/m	0.155 2.255	0.135 1.971
Unit load, $v_{1/60}$ @ 1.6 in. (40.64 mm)	Kips/ft. KN/m	0.119 1.736	0.084 1.222
EVDR $@v_{peak}$		0.231	0.232

SEAOSC parameters		**units**	**negative**	**positive**	**average**
Yield Limit State	v_{YLS}	Kips/ft. KN/m	-0.099 -1.448	0.128 1.872	0.114 1.660
	Δ_{YLS}	in. mm	-0.305 -7.74	0.601 15.26	0.453 11.50
	G'_{YLS}	Kip/in. KN/mm	2.606 0.456	1.708 0.299	2.010 0.352
Strength Limit State	v_{SLS}	Kips/ft. KN/m	-0.155 -2.262	0.161 2.353	0.158 2.308
	Δ_{SLS}	in. mm	-1.210 -30.73	1.207 30.66	1.209 30.70
	G'_{SLS}	Kip/in. KN/mm	1.025 0.179	1.069 0.187	1.047 0.183

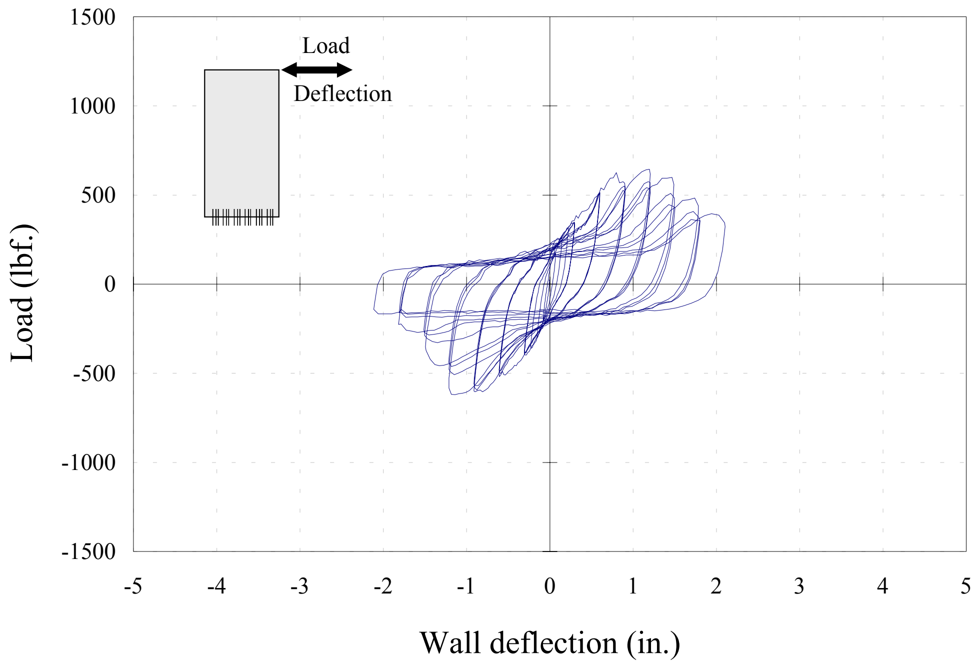


Figure 04NAc2- a. Observed load-deflection curve[1].

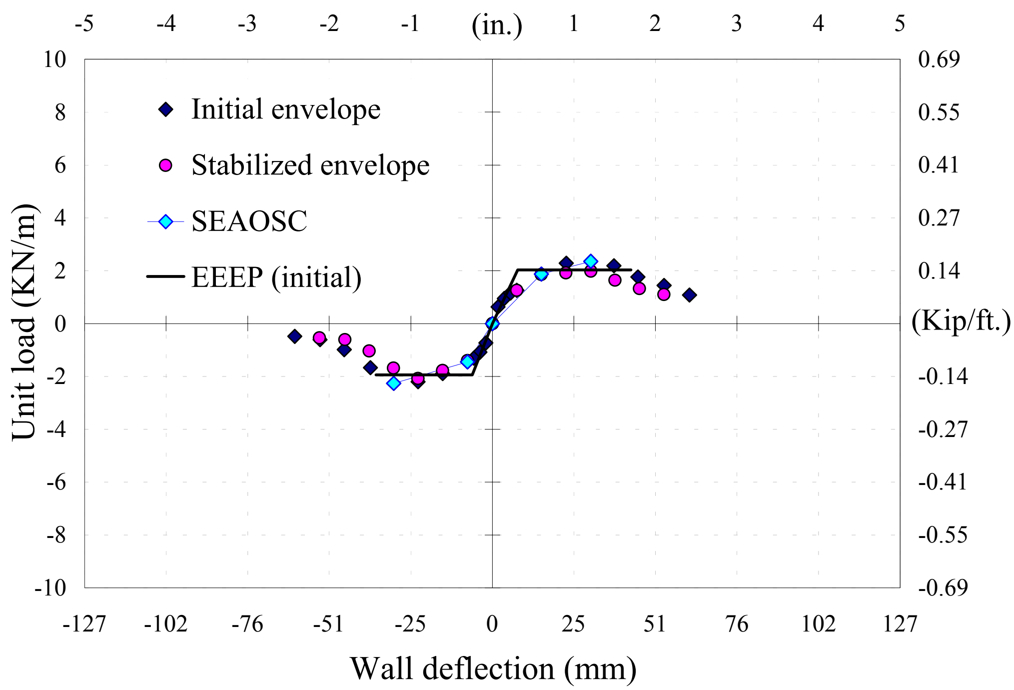


Figure 04NAc2- b. Envelopes, SEAOSC, and EEEP curves[2].

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[1] The scale of the graph varies between test series.
[2] The scale of the graph is uniform between test series for comparison purposes.

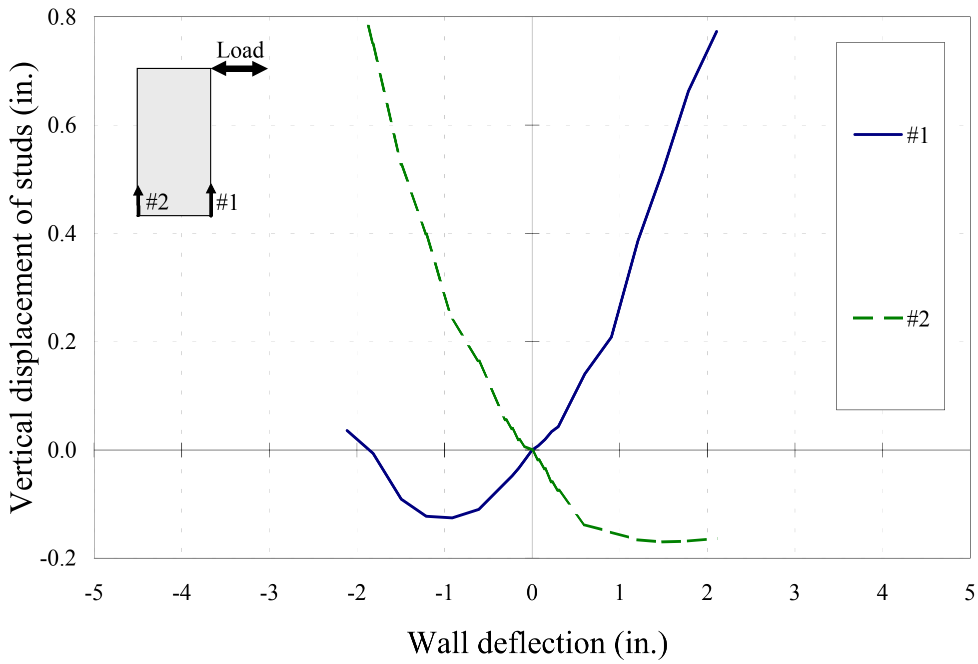

Figure 04NAc2- c. Vertical displacement of studs (initial envelope).

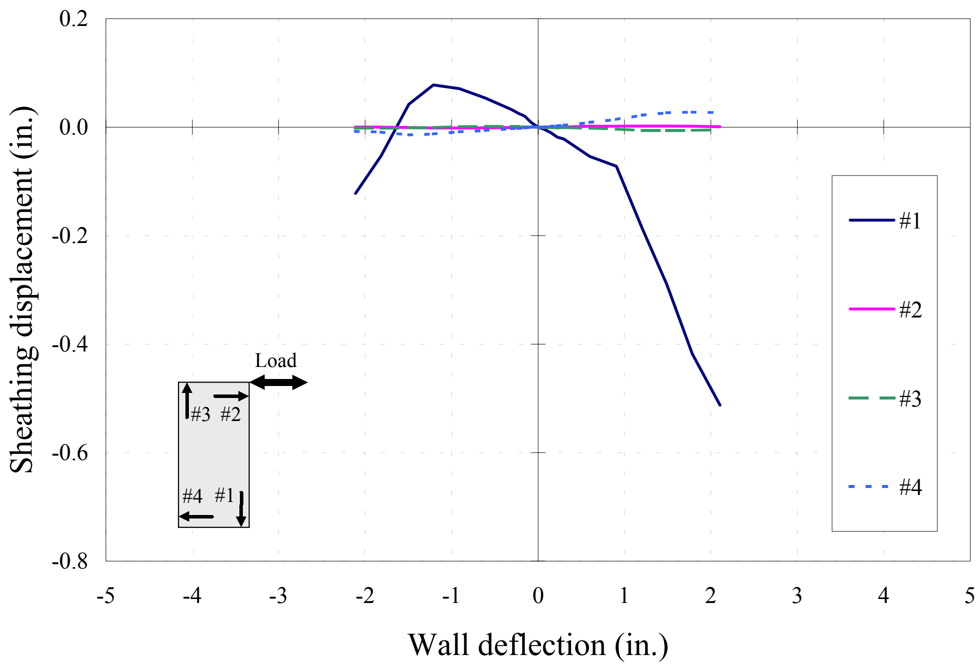

Figure 04NAc2- d. Sheathing displacement (initial envelope).

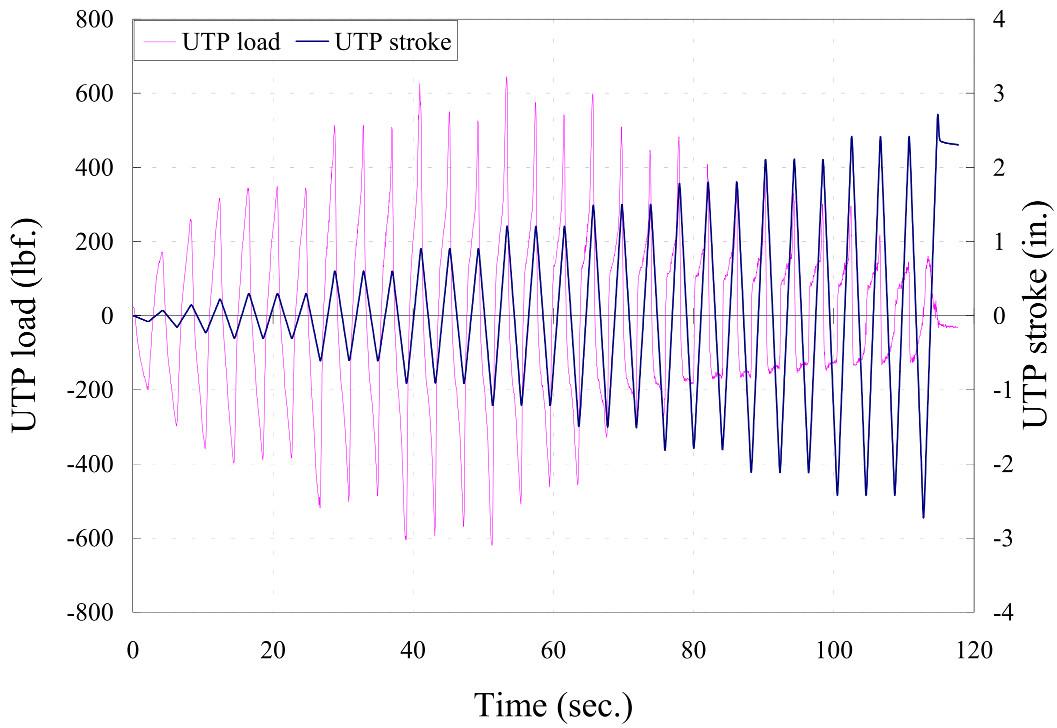

Figure 04NAc2- f. Load- and displacement-time record.

Table 04NAc2r. Data summary.

Specimen	**04NAc2r**	**Per unit length**	
Nails		**cyclic test**	
Wall length		**4.00ft.**	**1.219m**
Date: 8-10-1998 **Time:**	19:11		
EEEP Parameters	**units**	**initial**	**stabilized**
Peak unit load, v_{peak}	Kip/ft. KN/m	0.178 2.601	0.156 2.278
Drift at peak load, Δ_{peak}	in. mm	1.802 45.76	1.507 38.29
Yield unit load, v_{yield}	Kip/ft. KN/m	0.163 2.383	0.147 2.143
Drift at yield load, Δ_{yield}	in. mm	0.289 7.33	0.391 9.94
Proportional limit, $0.4v_{peak}$	Kip/ft. KN/m	0.071 1.040	0.062 0.911
Drift at prop. limit, $\Delta@0.4v_{peak}$	in. mm	0.126 3.20	0.166 4.23
Unit load at failure or $0.8v_{peak}$	Kip/ft. KN/m	0.143 2.081	0.125 1.823
Drift at failure, $\Delta_{failure}$	in. mm	2.493 63.31	2.311 58.71
Shear modulus, G @$0.4v_{peak}$	Kip/in. KN/mm	4.583 0.803	3.002 0.526
Work until failure per unit length	Kip·ft./ft. KN·m/m	0.600 2.671	0.577 2.568
Unit load, $v_{1/300}$ @ 0.32 in. (8.13 mm)	Kips/ft. KN/m	0.117 1.707	0.115 1.683
Unit load, $v_{1/200}$ @ 0.48 in.(12.19 mm)	Kips/ft. KN/m	0.137 2.003	0.130 1.897
Unit load, $v_{1/100}$ @ 0.96 in. (24.38 mm)	Kips/ft. KN/m	0.170 2.474	0.151 2.198
Unit load, $v_{1/60}$ @ 1.6 in. (40.64 mm)	Kips/ft. KN/m	0.176 2.572	0.155 2.256
EVDR @v_{peak}		0.191	0.189

SEAOSC parameters		**units**	**negative**	**positive**	**average**
Yield Limit State	v_{YLS}	Kips/ft. KN/m	-0.114 -1.667	0.115 1.675	0.115 1.671
	Δ_{YLS}	in. mm	-0.302 -7.67	0.299 7.59	0.300 7.63
	G'_{YLS}	Kip/in. KN/mm	3.028 0.530	3.072 0.538	3.050 0.534
Strength Limit State	v_{SLS}	Kips/ft. KN/m	-0.177 -2.587	0.179 2.616	0.178 2.601
	Δ_{SLS}	in. mm	-1.814 -46.06	2.109 53.58	1.961 49.82
	G'_{SLS}	Kip/in. KN/mm	0.782 0.137	0.680 0.119	0.727 0.127

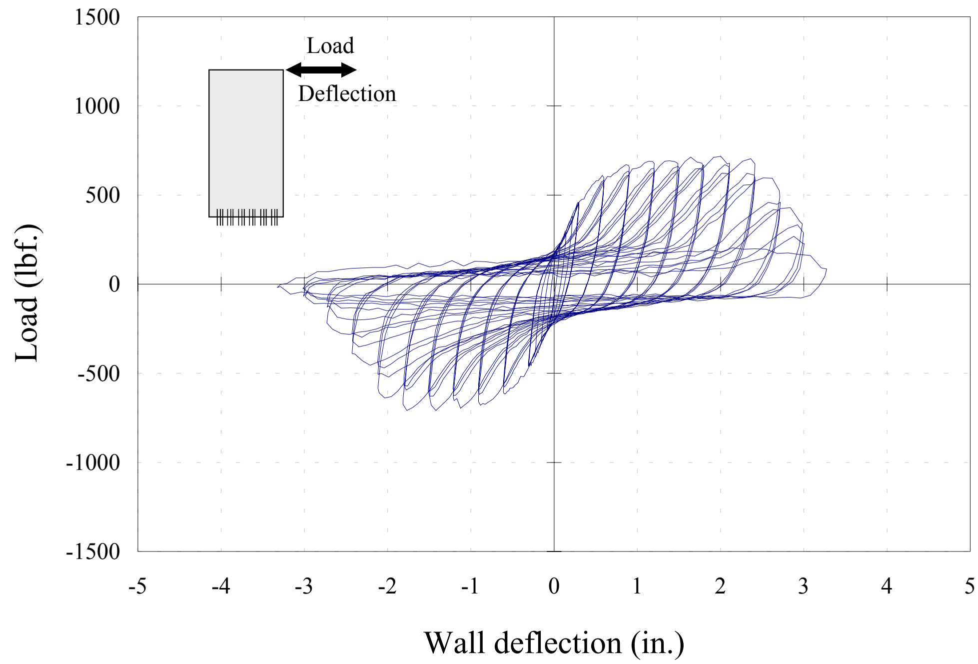

Figure 04NAc2r- a. Observed load-deflection curve.

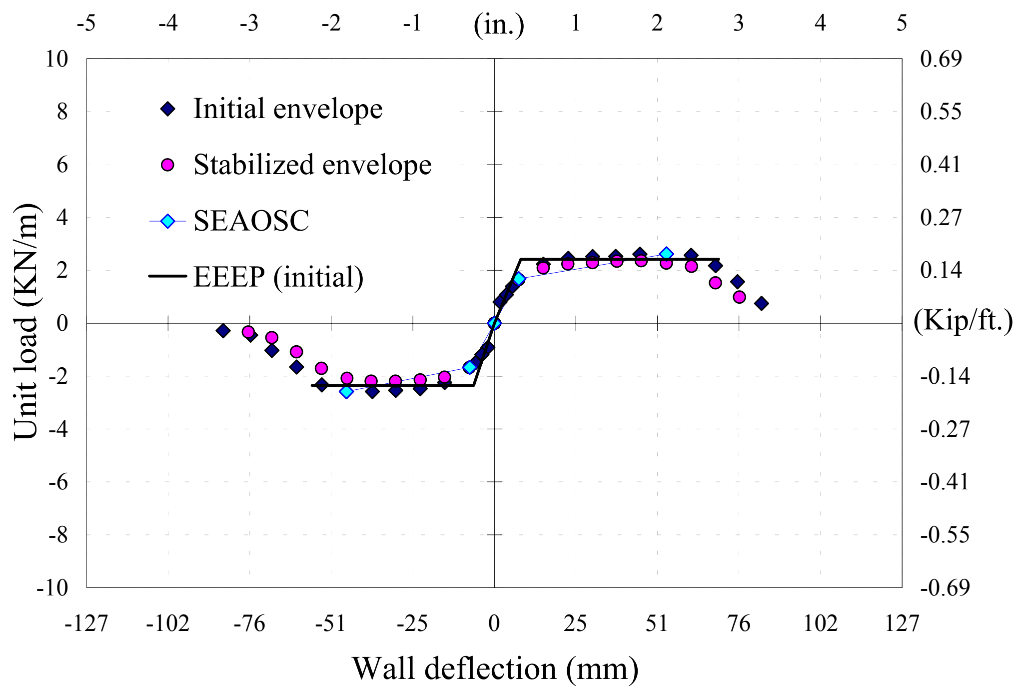

Figure 04NAc2r- b. Envelopes, SEAOSC, and EEEP curves.

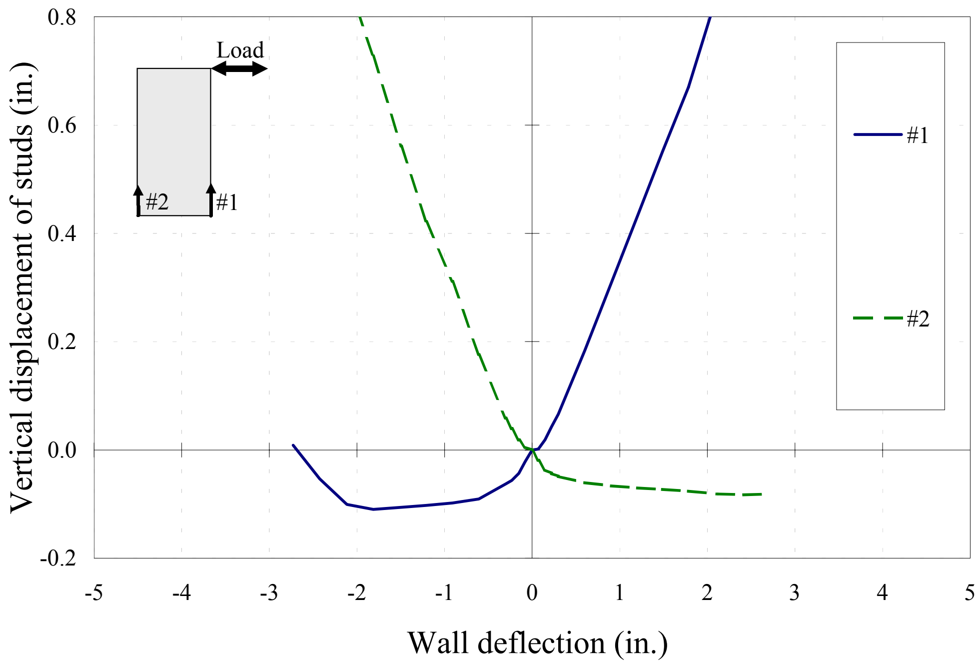

Figure 04NAc2r- c. Vertical displacement of studs (initial envelope).

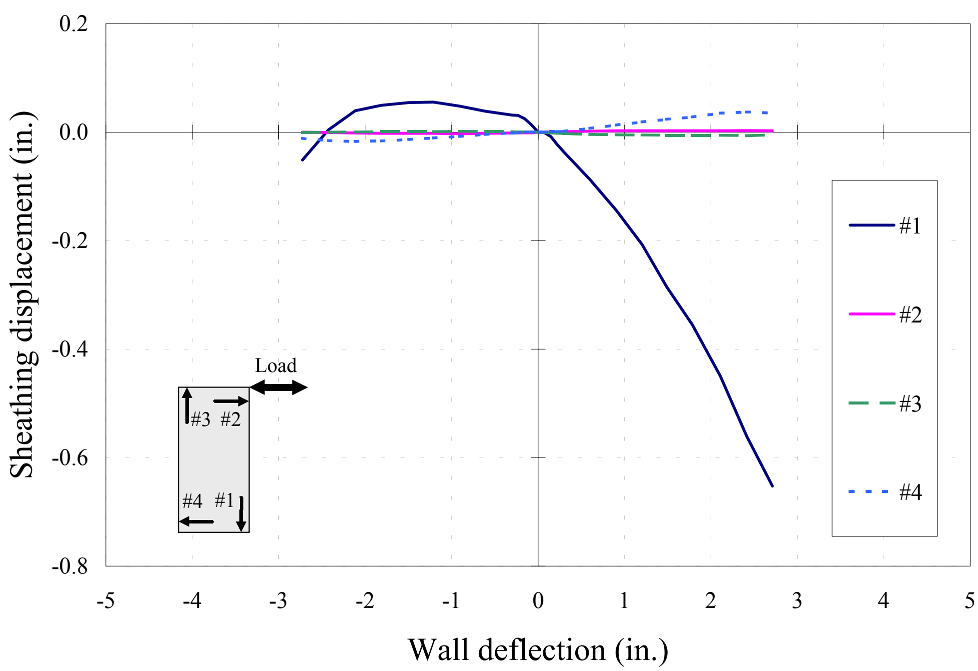

Figure 04NAc2r- d. Sheathing displacement (initial envelope).

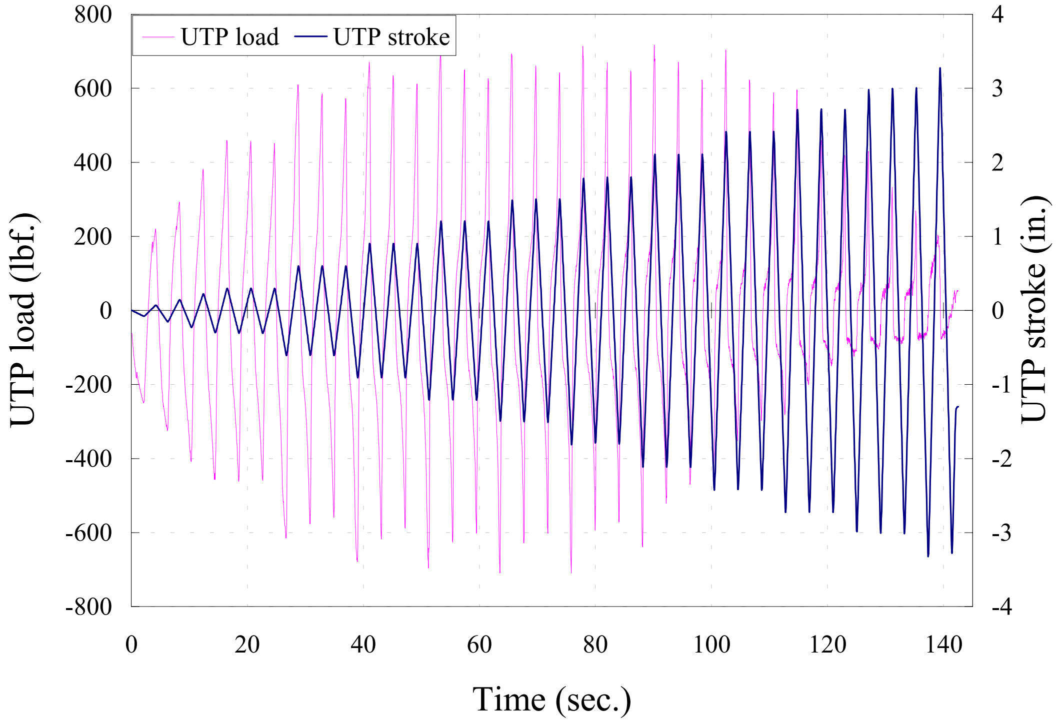

Figure 04NAc2r- f. Load- and displacement-time record.