

SLENDERWALL

LOAD TESTING

by

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SLENDERWALL PANEL LOAD TESTING

GENERAL

A SLENDERWALL panel manufactured by Smith Midland was provided to DPL Engineers for static load testing March 1996.

SPECIMEN

An 8 foot by 16 foot Slenderwall sample panel; 2 inch thick concrete panel with 3/4" architectural joint/chamfer along face of concrete 16 foot axis, reinforced by WWM 6x6/2.0x2.0 (Galvanized WWM 6x6/2.9x2.9 is standard), Galvanized 16 gauge studs @ 24" o.c. with welded black steel nelson anchors @ 24" o.c. embedded in concrete and 14 gauge top and bottom track was visually inspected and used for testing.

The test panel had been produced two years prior to testing and had been exposed to weather approximately 2 years in Smith Midland's yard.

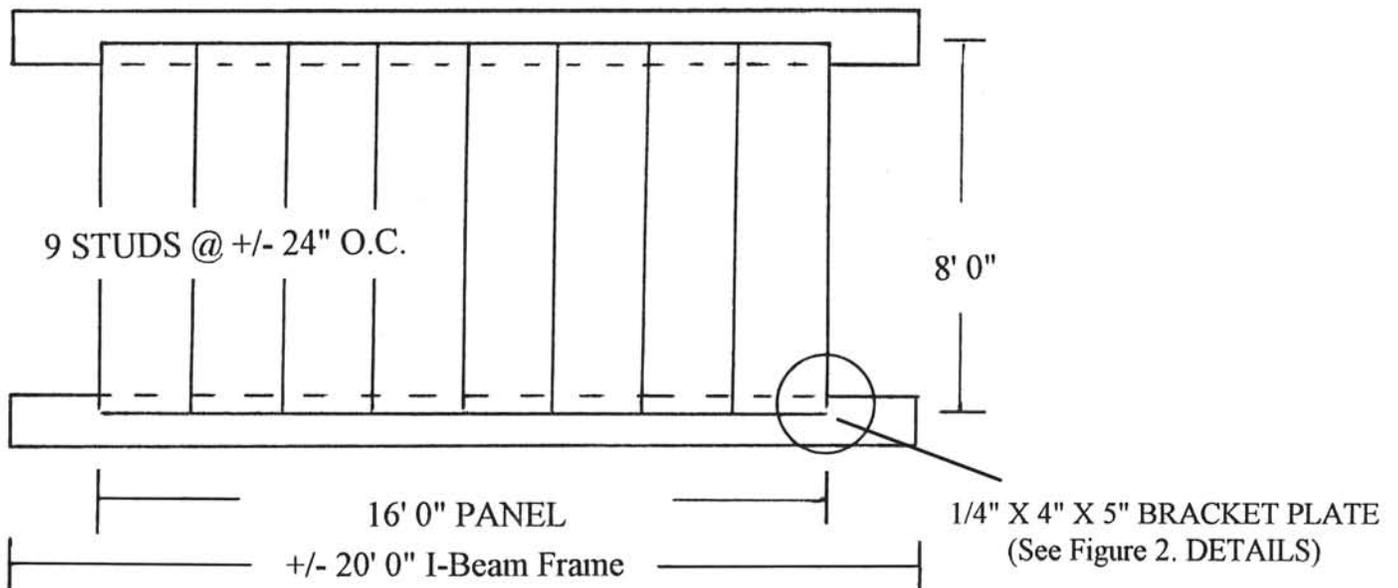


FIGURE 1. SLENDERWALL PANEL

APPARATUS

1/4" x 5"x4" steel plates were bolted by 2 1/2" diam. grade 2 bolts on every other (alternate) steel stud end (48" o.c.), welded to steel I beams, simulating typical building construction and panel attachment configuration.



FIGURE 2. DETAILS - SLENDERWALL PANEL WELD AND BOLT CONNECTIONS

APPARATUS

The Panel was laid horizontally concrete face up. A wood "crib" was placed on top to retain the surcharge load. and loaded with gravel (102.4 lbs/cu. ft.). Gravel dropped from front end loader onto panel, and leveled from heaped piles by two men provided loading of SLENDERWALL panel. **Static load test result values reported do not take into account dynamic shock loading and concentrated loading of workers or dropped gravel and may be considered conservative. Test values and results are reported in APPENDIX A.**

PROCEDURES

Gravel dropped from a front end loader onto the panel and leveled from heaped piles by two men provided surcharge loading of the SLENDERWALL panel. Six inch lifts of gravel were placed in the wood crib to provide increments of 51.2 lbs./sq.ft. loading. Three strain gauges capable of reading to .001" were placed mid-length along center of panel. Gauge #1 was placed underneath bolted (fixed end) stud, gauge #2 was placed underneath concrete face and gauge #3 underneath non-bolted (free end) stud.

Visual inspection of panel and gauges was made during incremental loading to observe Panel components during loading.

The panel was loaded and tested to ultimate failure.

COMMENTARY

Test results are summarized in Appendix A. Test values reported do not take into account additional dynamic shock loading and concentrated loading of panel due to gravel dropped several feet by the loader or by weight and movement of men spreading lifts of gravel on the panel.

Panel in Horizontal position also added dead load of panel (28 lb./sq.ft.) to surcharge load, though only soffit type installation of panel would duplicate this configuration on buildings.

Minor hairline cracks and first deformation of fixed ends of alternate studs were the first noted at approximately 130 lbs./sq.ft. total load.

Deflection of L/360 ($8.0' \times 12" / 360 = 0.267"$) was reached after approximately 80 lbs./sq.ft. total load.

Inelastic failure of panel - structural cracks in concrete, rotation of nelson anchors, and bending of steel studs occurred around 180 lbs/sq.ft. load.

Panel assembly; concrete panel bolts and welds were still one unit as tested to Ultimate failure at loadings approaching 300 lbs./sq.ft, and gradual yielding of components was observed. Steel frame though grossly deformed was still in one piece - bolts and welds of nelson anchors and weld plates were unbroken. Concrete panel had severely broken, and WWM was observed to be sheared in several places, but large quantities of concrete facing were still held to steel frame by welded nelson anchors.

(WWM used in this panel was lighter than that used in standard panel production)

APPENDIX A

SLENDERWALL LOAD DEFLECTION TESTING

TOTAL LOAD DL+LL LB/SQ.FT.	STATIC LOADING LB/SQ.FT.	DEFLECTION GAUGE #1 BOLTED END	DEFLECTION GAUGE #2 CONCRETE	DEFLECTION GAUGE #3 NOT BOLTED
28	0	0.00"	0.00"	0.00"
79	51	0.15"	0.26"	0.19"
130	102	*A	*B >0.70"	0.55"

SLENDERWALL 8'X16' panel tested in horizontal position

*A - Stud movement-first signs of bolted/welded stud end deformation
 first hairline cracks appear in concrete

*B - L/360 deflection exceeded

WIND LOAD CALCULATIONS per ANSI/ASCE 7-93 *

WIND PRESS. LB/SQ.FT	WIND SPEED MPH	BUILDING HEIGHT FEET	EXPOSURE RATING
50	150	300	A
51	120	300	B
48	100	300	C
50	95	300	D
52	110	200	C
51	100	200	D

*PROVIDED FOR COMPARISON ONLY