

October 24, 2001

Report No. 689-16499-1

Mr. Ken Sliefer  
Bowco Industries, Inc.  
5486 SE International Way  
Portland, Oregon 97222

Dear Mr. Sliefer:

RE: Pulling Iron Load Testing

This report presents the results of load testing conducted on pulling irons manufactured by Bowco Industries, Inc. Testing was performed at the PSI – Portland, Oregon laboratory, an International Council of Building Officials (ICBO) accredited testing laboratory.

A total of six (6) pulling irons were tested. Two (2) sample pulling irons were loaded in a vertical pull configuration, two (2) sample pulling irons were loaded in a 45° pull configuration and two (2) sample pulling irons were loaded in a horizontal pull configuration. The sample pulling irons were embedded in 5' x 5' x 6" concrete pads fabricated by Utility Vault Company of Wilsonville, Oregon. Concrete mix design documentation provided by Utility Vault Company identifies that the pads were cast from a 28 day - 6000 psi mix, batches 29, 30 & 31 dated September 2001. All pads were tested at an age of greater than 28 days.

Four (4) 2-1/2" through holes spaced in a rectangle at 24" and 6-1/2" on-center provided a means of securing the test pads during loading. The pulling irons were embedded in the pads such that their long axis was perpendicular to the long axis of the securing hole pattern. Load was applied to the top of the pulling irons, at their bend, perpendicular to their long axis.

Load measurements were obtained utilizing an Omegadyne, Inc. Model LC8251-126-75K, S/N 103736. ring style compression load cell linked to an Omega DP41-S-MDS digital indicator. The load cell / digital indicator system was calibrated by AdTek Advanced Calibration

Technologies S/N 749810, NIST No. SJT.01/107733. A redundant calibration of the load cell / digital indicator system was conducted by PSI immediately prior to testing, utilizing a Tinius-Olsen Universal Load Machine S/N 123765, NIST No. SJT01/107294. Load was applied with a hollow plunger hydraulic cylinder. Test results are presented in Table 1.

Sample No.	Loading Configuration	Ultimate Load, lbs.	Load at Initial Crack, lbs.
1	45°	31,720	16,770
2	45°	28,200	20,400
3	Horizontal	49,380	34,240
4	Horizontal	42,510	28,670
5	Vertical	25,980	21,710
6	Vertical	27,340	0

Table 1: Pulling Iron Load Testing Results

A hairline crack was observed in Sample 6 prior to loading. The width of this crack was observed to expand at an approximate load of 20,000 lbs. The failure mode for each sample may be described as slippage of the stranded embedded rod. Loading was discontinued once the resisted load decreased significantly from the ultimate load for samples 1 through 5, leaving the ends of the embedded rods within the sample pads. One (1) end of the embedded rod pulled out of the pad for Sample 6 prior to the discontinuation of loading.

Thank you for selecting PSI to provide this load testing service. I may be reached at (503) 978-4713 to discuss this report.

Sincerely,



Andrew Drexler, PE

Project Engineer