HDPE ADJUSTING RING
LOW TEMPERATURE TESTING

INTRODUCTION

This report presents the results of testing performed on high-density polyethylene (HDPE) adjusting rings used in conjunction with concrete manhole structures. The scope of our work was limited to the following:

- Perform low temperature compression testing of a series of adjusting ring coupon specimens.
- Perform compression testing of a series of coupon specimens at ambient laboratory temperatures.
- Prepare a report comparing the results of the low and ambient temperature testing.

Our work was requested and authorized by Mr. Gale Jacobsen of LADTECH, Inc. on September 4, 1998, and performed in general accordance with AET Proposal No. 5-98-039, dated July 13, 1998.

BACKGROUND INFORMATION

The adjusting rings are manufactured from 100% recycled plastic. Per LADTECH, the predominant source product for the raw plastic curbside collected, post-consumer, blow-molded milk and detergent bottles. The bottles are initially manufactured from high-density polyethylene as identified by ASTM Standard D-1248. Following shredding and cleaning of the bottles, the rings are manufactured by injection molding techniques.

TEST PROCEDURES

The low temperature testing was performed in the American Engineering Testing (AET) laboratory. The loading apparatus consisted of a 1,000,000 pound capacity Forney compression machine with a digital readout. Deflection measurements were obtained with dial gauges accurate to 0.001".

The test coupons were cut two, 2" whole adjusting rings and consisted of single cell "boxes" (one whole ring consists of 4 cells). The inner alignment flange was cut off to allow the coupon to rest flat in the test assembly. A total of 15 coupons were prepared for low temperature testing. A total of 12 coupons was prepared for comparative testing at ambient temperatures.

The low temperature coupons were cooled overnight to approximately 5 degrees F in a Logan freeze-thaw chamber. The ambient temperature coupons remained in the laboratory at approximately 70 degrees F. At the time, the low temperature coupons were removed one at a time and tested to failure. Deflection measurements were obtained at 500 pound increments. The ambient coupons were tested in a similar fashion.

TEST RESULTS

The HDPE adjusting ring low temperature tests were performed on November 23, 1998. Results of the testing are detailed below:

Low Temperature Coupons	Test Number Load at Failure (lbs)	Deflection at Failure (in)
1	7,510	0.073
2	7,610	0.095
3	7,530	0.111
4	7,980	0.076
5	7,370	0.062
6	8,010	0.074
7	8,000	0.090
8	7,480	0.074
9	7,500	0.076
10	7,670	0.071
11	7,050	0.073
12	7,690	0.075
13	7,920	0.072
14	8,010	0.078
15	7,380	0.068
Average	7,650	0.078

Ambient Temperature Coupons

Test Number	Load at Failure (lbs)	Deflection at Failure (in)
2	5,970	0.124
3	5,770	0.049
4	5,660	0.075
5	5,900	0.089
6	6,340	0.096
7	5,910	0.084

8	5,900	0.083
9	6,330	0.073
10	6,260	0.067
11	6,060	0.096
12	5,970	0.075
Average	6,010	0.083

The average failure load of the low temperature coupons was 27% higher than the ambient coupons. The average deflection at failure of the low temperature coupons was 6% less than the ambient coupons.

The failure mode of both the low temperature and ambient coupons was ductile.

DISCUSSION

The results of the low temperature compression testing compare favorably with the coupons tested at ambient temperatures. The increase in failure load and decrease in deflection of the low temperature coupons can be attributed to the decreased ductility of the coupon specimens at 5 degrees F.

When extrapolating the results of this testing to the static testing of whole ring stacks, the effect of lower temperatures on the performance of the adjusting rings under normal loading is minimal.

For more information about testing procedures and existing test results, contact LADTECH, Inc. at testing@ladtech.com