



January 21,2003

**RE: Municipex Pull out Tests**

This is to follow up on your letter sent on November 22, 2002 requesting pull out tests on the Municipex pipes supplied.

We compared the results with AWWA Standards for Underground Service Line Valves and Fittings, revision number C800-01 Sec. 4.4.9 (Other Connections).

It states that compression connections, copper tube flare connections, and swivel connections shall be designed at a working pressure of 150 psig (1,050 kPa). In standard Cambridge Brass practice we use a safety factor of 3 on all our connections so the minimum allowable Burst Pressure is 450 psig.

Following are the results of the tests conducted:

On the ¾” Municipex pipe with inserts the average pull out was 571 lbf with a burst pressure of 950 psig (calculated with the following formula: Pressure = Force/Area), which exceeds the AWWA standard. Without the inserts the pull out was 98.56 lbf on average with a burst pressure of 164 psig which does not meet the AWWA standard nor Cambridge Brass safety factor of 3.

On the 1” Municipex pipe with inserts, the average pull out was 734 lbf with a burst pressure of 738 psig which exceeds the AWWA standard. Without the inserts the pull out was 262 lbf on average with a burst pressure of 263 psig which does not meet the AWWA standard nor our safety factor of 3.

On the 1 ¼” Municipex pipe with inserts, the average pull out was 1261 lbf with a burst pressure of 850 psig which exceeds the AWWA standard. Without the inserts the pull out was 430 lbf on average with a burst pressure of 290 psig which does not meet the AWWA standard nor our safety factor of 3.

On the 1 ½” Municipex pipe with inserts, the average pull out was 1940 lbf with a burst pressure of 935 psig which exceeds the AWWA standard. Without the inserts the pull

out was 643 lbf on average with a burst pressure of 310 psig which does not meet the AWWA standard nor our safety factor of 3.

On the 2" Municipex pipe with inserts, the average pull out was 2840 lbf with a burst pressure of 800 psig which exceeds the AWWA standard. Without the inserts the pull out was 856 lbf on average with a burst pressure of 241 psig which does not meet the AWWA standard nor our safety factor of 3..

In conclusion after performing the pull out tests on ¾", 1", 1 ¼", 1 ½" and 2" Municipex Pipes (PEXa) with and without inserts, our recommendation is that you use the stainless steel inserts to ensure a good connection between the pipe and the Cambridge Brass compression connection. Without the insert the safety factor is of 1 or 2 (varying on the size) but with the insert added to the connection your safety factor raises to 5 or 6.

If you have any questions regarding the tests and results, do not hesitate to contact me.

Regards,

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## Crossed Linked Polyethylene Tubing (ASTM F876)

