

Couplings: Cam & groove couplings: 2" Campbell Cobra stainless C x E
- Coupling/ferrule system rated to 250 psi. WP

Hose: Chemical hose: 2" Gates Mustang 45HW rated to 200 psi.

Attachment: Crimped: plated steel ferrules

Goal: To exceed 800 psi. @ 34°F (hose WP of 200 psi. @ 4 to 1 Safety Factor)

Results: Couplings and hose exceeded 5 times WP. Coupling/ferrule leak at 1384 psi.

Although the test was not conducted to ASTM D380 standards due to the reduced temperature, all other aspects were in conformance. See engineering details below.

HOSE: 2" Gates Mustang 45HW acid chemical suction discharge hose, 200 psi. WP; initial length of 19."

END CONNECTION #1: Assembled by Campbell, C-316-200 C, a 2" part C cam & groove coupling with a FPS200240 steel ferrule. No lubrication was used during assembly. The hose wall on this end measured between .285" and .305" for a .295" average. The ferrule was selected and crimp diameter determined by interpolating the crimp chart due to expire 9-30-06. This end was crimped to $\phi 2.590$ " using a Uniflex HM370I crimper with 62 dies. This end was connected to our tester manifold using an A-SS-200 2" female adapter part A with a 2" x 3/4" reducing bushing and a GMS-3 3/4" male spud through our usual 3/4" ground joint style connection. Teflon tape and pipe dope was used on the NPT threads. See first end connection photo.

END CONNECTION #2: Assembled by Campbell, E-316-200C, a 2" part E cam & groove adapter with a FPS200244 steel ferrule. The hose wall on this end measured .295" to .315" or .305" average. The crimp diameter was determined and ferrule selected from the same chart as above. It was crimped to $\phi 2.605$ " using the same crimper and dies as above. This end was connected to a B-SS-200 2" male coupler that was fitted with a 2" female NPT valve adapter with valve attached. Teflon tape and pipe dope was used on the NPT threads. See second end connection photo.

TEST: The assembly was filled with water and air was evacuated from the system by use of the valve at the free end of the assembly. The room was cooled overnight producing an assembly test temperature of 34°F as measured with a thermometer placed in the proximity of the hose and verified by a fixed mechanical gauge on the feed water line. Pressure was raised rapidly, but slow enough to allow limited observation and note taking; within ASTM D380 parameters. See in tester photo. The assembly was made up and crimped about 24 hours before the test.

Pressure was raised and observations made at 200, 400, 600, 800, 1000 and 1200 psi. No leaks or movement was detected. The hose elongation was measured at 1/8, 3/8, 7/8, 1-3/8, 1-7/8, and 2-3/8" respectively.

While increasing pressure, movement of about 1/8" and a leak was detected at the second end at 1384 psi. A photo was captured of the leak and movement, see leak photo. The assembly was removed and cut apart for examination and fitting retrieval. There was no visual indication for the cause of the leak; the shank had no visible flaws. The ejected second end inner tube did show a shank impression but there were no cuts visible.

CONCLUSION: The assembly went over 6 times the hose working pressure of 200 psi. The assembly also went over 6 times the cam & groove working pressure of 250 psi. Operating this assembly at the intended 250 psi. cam & groove working pressure is safe and adequate at this reduced temperature. There is no reason to de-rate for reduced temperature with this attachment method and fitting/hose combination.

prepared by Dave Street, Engineering Manager