Environmental Sampling Supply
Leakproof and Accuracy Classification
CapSure® Bottles

ESS CapSure bottles have successfully met and exceeded the following scientific criteria in which these tests were conducted by an independent laboratory:

1. **Vibration**
2. **Torque**
3. **Hydrostatic**
4. **Volumetric**
5. **Shipping (conducted internally)**

TEST CRITERIA 1 VIBRATION - ESS closure system (custom mated pair bottle and closure combination) bottles were filled with water and the caps tightened to approximately 15 in lb. Index marks were made on each cap and bottle. One bottle from each of the four groups was placed in a box and secured with packing material (tight pack). One bottle from each group was placed in a box and separated with cardboard (loose pack).
The boxes were vibrated using ASTM profiles for Air Level 2 and Truck Level 2. Each profile was run for 3 hours in each of 3 axes (x, y and z) for a total of 18 hours. At the conclusion of the 18 hour vibration test the bottles were visually examined. All eight bottles showed no signs of damage, loss of liquid, or change in tightness of the cap (movement of index line). The closure system passed Test Criteria 1.

TEST CRITERIA 2 TORQUE - ESS closure system (custom mated pair bottle and closure combination) was tested for movement of closures during the vibrational test. The force required to remove the caps was determined by the instrumental torque test in which the bottle was secured to a dial torque wrench, BMI No. 8037, cal date 1-10-2014, and the cap was turned by hand. At the conclusion of the torque test, it was found that there was no evidence of movement. The closure system passed Test Criteria 2.

TEST CRITERIA 3 HYDROSTATIC – ESS closure system (custom mated pair bottle and closure combination) was tested in the following manner: Following the vibration and torque test, the caps were retightened to 15 in lb. and tested for leakage at 2 psig pressure. Each bottle was modified to receive a special fitting to seal and pressurize from the bottom of the bottle. A Wheeler Rex hydrostatic tester was used with a 0-30 psi pressure gauge BMI # 243 cal date 3-6-12. The bottle was filled with water, inverted and pressurized to 2 psig and held for a minimum of 2 minutes. If no water escaped the container from the cap end, it was deemed leak proof. The closure system passed Test Criteria 3.

TEST CRITERIA 4 VOLUMETRIC – ESS closure system (custom mated pair bottle and closure combination) containers were subjected to Volumetric testing to verify accuracy levels of graduation of containers. Calibrations of volumetric ware are accomplished by using methods and specifications prescribed in ASTM E 542, *Practice for Calibration of Volumetric Ware*, and ASTM E 694, *Specification for Volumetric Ware*. Also used are Density Tables from CRC Handbook for Chemistry and Physics. Measurements were made gravimetrically with water. The containers revealed an accuracy level much higher than the average acceptable standards in our industry. The closure system passed Test Criteria 4.

TEST CRITERIA 5 SHIPPING – ESS closure system (custom mated pair bottle and closure combination) containers were subjected to a preserved shipping test. Samples were prepared with normal quantities of nitric acid and sulfuric acid. Each ESS closure system was individually placed in a zip lock bag with a piece of brown paper (which would indicate vapor escape). Half of the samples were shipped and returned by air, the other half via ground. There was no discoloration of the brown paper, the ESS closure system revealed no signs of leakage of either liquid or gas. The closure system passed Test Criteria 5.

The ESS Closure System is hereby deemed "leakproof" and "accurate" by the verification and assessment of successful outcomes of the above listed tests conducted by an independent laboratory.