

Technical Tidbit

The ASTM F739 testing protocol, "Test Methods for Resistance of Protective Clothing Materials to Permeation by Liquids and Gases" is used to evaluate fabrics' resistance to permeation through the material. An appropriate piece of the fabric to be tested is placed in an apparatus as depicted in Figure 1. The "outside" surface of the fabric is exposed to the liquid or gas against which the fabric is being tested. The "inside" surface faces the sampling portion of the apparatus.

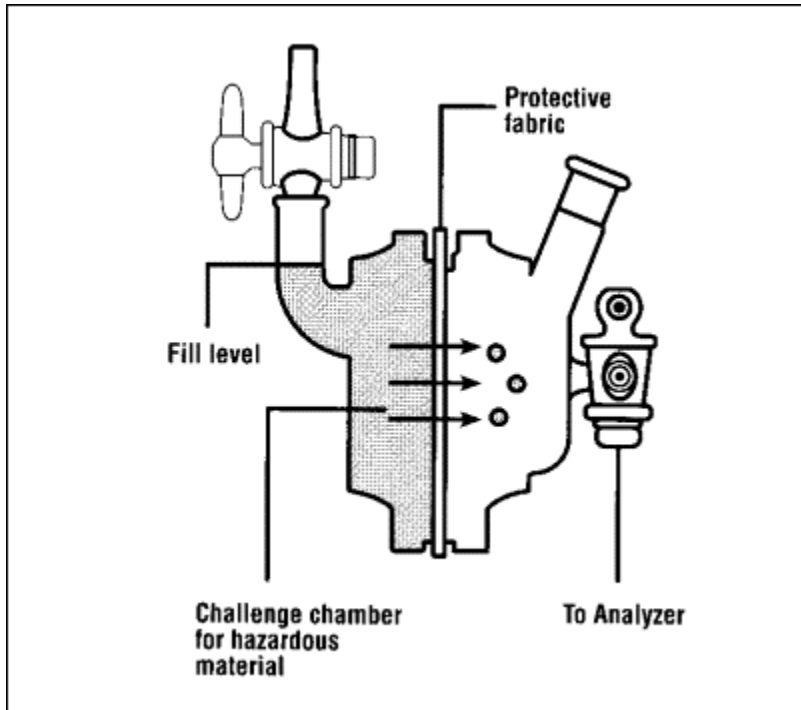


Figure 1 – ASTM F739 Testing Apparatus*

As the chemical moves through the fabric, the analytical device ("analyzer") connected to the sampling chamber will detect it. The sensitivity of the "analyzer" will vary depending on the chemical being tested.

Sometimes permeation is a misunderstood process. It is not chemical moving through holes in the fabric. It is actually the fabric absorbing the chemical and becoming saturated with the chemical and then desorbing the chemical on the "inside" surface. When this occurs and there is sufficient chemical present in the sampling chamber such that the analyzer can detect the chemical, then actual breakthrough has occurred. A typical test period for permeation is 8 hours, if no permeation is detected, the material will be reported with a breakthrough time of >480 minutes. The reported breakthrough times are typically based on the average of multiple tests. A >480 minute breakthrough time does not mean permeation didn't occur, it just means none was detected.



Another problem with fabric testing and its relation to real-world use is that only single pieces of fabric are tested for permeation rates. In the real-world suits, boots and gloves may have seams in the product that allow the fabric to be constructed into a shape that will fit a hand, foot or body. In addition, suits will have seams that allow entry and exit into the products but then must be sealed for use. Likewise, there are those areas where one garment type interfaces to another garment type, e.g., gloves to the suit or boots to the suit. As everyone that has been through basic HAZMAT training knows, it is important to seal these interfaces to prevent chemical exposure. Manufacturers don't report breakthrough times or permeation tests performed on these seams and interfaces, yet they are probably the most susceptible to chemical permeation and the eventual chemical exposure by the user.

The user of Chemical Protective Clothing (CPC) products must keep these facts in mind and understand what the test and the results represent with regard to real-world conditions.

*AristaTek has adapted this figure and portions of this discussion from DuPont de Nemours and Company's Tychem® Chemical Protective Clothing publication.