
NFPA 1991 and 1992 were written in the late 1980s in response to the growing number of hazardous material responders who were using chemical protective clothing from a variety of sources without consistent protection. In 1985, the National Transportation Safety Board recommended that government agencies support the development of protective standards for chemical protection after several first responders were exposed to a hazardous chemical from a leaking railcar, even though the manufacturer recommended the use of their suits for the chemical involved. As a result of these efforts, NFPA 1991 and NFPA 1992 were prepared to correspond to the Environmental Protection Agency’s Level A and B designations that are common in the hazardous chemical response and remediation industries. The following table shows how the two standards were positioned to provide performance-based definitions of chemical protective clothing performance.

Definitions of Protective Ensemble Types by Performance Tests in NFPA Standards

<table>
<thead>
<tr>
<th>Type of Ensemble</th>
<th>Corresponds to</th>
<th>Material Performance*</th>
<th>Overall Ensemble Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vapor-protective (NFPA 1991)</td>
<td>EPA Level A</td>
<td>Permeation resistance</td>
<td>Gas-tight integrity</td>
</tr>
<tr>
<td>Liquid-splash protective (NFPA 1992)</td>
<td>EPA Level B</td>
<td>Penetration resistance</td>
<td>Liquid-tight integrity</td>
</tr>
</tbody>
</table>

* Permeation resistance testing measures the passage of chemicals (liquids or gases) through a material at a molecular level and requires sensitive analytical equipment to detect chemical breakthrough; penetration resistance assesses how liquids physically penetrates materials, seams, or closures as determined visually.


NFPA 1991 defines an ensemble consisting of a suit with attached gloves that totally encapsulates the wearer and his or her breathing apparatus, that may also be worn with an overcover, outer gloves, and outer boots to meet the requirements of the standard. Ensembles must be provided in a minimum of four sizes and must have protective inverted pockets over exhaust valves. Gloves and footwear are subject to minimum length and height requirements, respectively. Performance requirements include:

- Inflation of ensembles to determine gas-tight integrity and shower testing for demonstrating liquid-tight integrity
- Permeation testing of suit, visor, glove, and footwear materials and seams against a 21-chemical battery to demonstrate resistance against a broad range of industrial chemicals; the chemical battery contains gases and liquids representing difference classes of chemicals
- Burst strength, puncture resistance, cold temperature performance, abrasion resistance, and flex fatigue testing of suit, glove, and footwear materials
- Breaking strength testing for seams and closures
- Leakage and mounting strength testing of exhaust valves
• Tests for evaluating the functional use of the ensemble and dexterity of gloves

NFPA 1991 also includes optional criteria for liquefied gas protection, flash fire escape protection, and chemical/biological terrorism agent protection (now addressed in NFPA 1994). Additional criteria are provided for each of the certification options. Product labels must clearly indicate which options apply to the specific ensemble.


NFPA 1992 addresses the second tier of hazardous materials response protection. This standard establishes the requirements for chemical liquid splash protection where no chemical vapor hazards exist during a hazardous material response. The liquid-splash protective ensembles are intended for situations where the primarily form of chemical exposure is in the form of short-term contact with liquid chemicals that do not provide skin-toxic or carcinogenic vapors. NFPA 1992 further permits the individual certification of garments, gloves, and footwear, which may not be part of an overall ensemble.

NFPA 1992 contains few design requirements and performance characteristics are similar to those specified in NFPA 1991 with the following differences:

• NFPA 1992 garments, gloves, and footwear are only tested for liquid-tight integrity and may not be gas-tight.
• Penetration testing is used instead of permeation testing.
• A smaller chemical battery is used for chemical resistance testing; gases, or liquid chemicals with known skin-toxicity or carcinogenic properties are not included.
• Exhaust valves are neither required nor evaluated.
• Physical strength and hazard resistance performance criteria are lower for NFPA 1992 items.
• Only one option is provided – for flash fire protection.