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Standard Performance Specification for Protective Clothing Worn by Operators Applying Pesticides[1]

This standard is issued under the fixed designation F2669; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification establishes minimum performance, classification, and labeling requirements for protective clothing worn by operators applying pesticide products, primarily field strength, in liquid form.

1.2 Protective clothing items covered by this specification include, but are not necessarily limited to, liquid-tight or spray-tight garments, coveralls, jackets, shirts, and pants.

1.3 This specification addresses protection provided by protective accessories, with the exception of those used for the protection of the head, hands, and feet.

1.4 This specification does not address protection against biocides, fumigants, or highly volatile liquids.

1.5 The values given in SI units are to be regarded as the standard.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1424 Test Method for Tearing Strength of Fabrics by Falling-Pendulum (Elmendorf-Type) Apparatus

D5034 Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)

D5035 Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)

F739 Test Method for Permeation of Liquids and Gases through Protective Clothing Materials under Conditions of Continuous Contact

F903 Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Liquids

F2130 Test Method for Measuring Repellency, Retention, and Penetration of Liquid Pesticide Formulation Through Protective Clothing Materials

2.2 *ISO Standards:*[3]

ISO 13688 ISO Protective Clothing—General Requirements

ISO 17491-4 Protective Clothing—Test Methods for Clothing Providing Protection Against Chemicals—Part 4: Determination of Resistance to Penetration by a Spray of Liquid (Spray Test)

ISO 27065 Protective Clothing—Performance Requirements for Work and Protective Clothing for Horticultural and Agricultural Pesticide Workers

3. Terminology

3.1 *Definitions:*

3.1.1 *decontamination, n*—reduction, removal, or neutralization of a contaminant or contaminants from protective clothing to the extent necessary to safely permit the protective clothing to be doffed (taken off), or reused, or discarded.

3.1.2 *finish, n*—chemical or mechanical modification or both of the fabric for a specific performance result.

3.1.3 *garment, n*—single item of clothing (for example, a shirt).

3.1.4 *penetration, n*—for chemical protective clothing, the movement of substances through voids in protective clothing materials or items on a non-molecular level.

3.1.4.1 *Discussion*—Voids include gaps, pores, holes, and imperfections in closures, seams, interfaces, and protective clothing materials. Penetration does not require a change of state; solid chemicals move through voids in the materials as solids, liquids as liquids, and gases as gases. Penetration is a distinctly different mechanism from permeation.

3.1.5 *permeation, n*—for chemical protective clothing, the movement of chemicals through protective clothing material items by the processes of (*1*) absorption of the chemical into the contact surface of the material, (*2*) diffusion of the absorbed molecules throughout the material, and (*3*) desorption of the chemical from the opposite surface of the material.

[1] This specification is under the jurisdiction of ASTM Committee F23 on Personal Protective Clothing and Equipment and is the direct responsibility of Subcommittee F23.30 on Chemicals.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

3.1.5.1 *Discussion*—Permeation is a distinctly different mechanism from penetration.

3.1.6 *protective clothing, n*—an item of clothing that is specifically designed and constructed for the intended purpose of isolating all or part of the body from a potential hazard; or, isolating the external environment from contamination by the wearer of the clothing.

3.1.6.1 *Discussion*—For the purpose of this specification, protective clothing materials include those materials used in the construction of the suit or clothing that serve as the primary barrier for the wearer. Protective clothing materials do not include materials used in the construction of integral visors, gloves, and footwear.

3.1.7 *seam, n*—junction between two or more pieces of material created by sewing, welding, or another method.

3.1.8 *test chemical, n*—solid, liquid, or gas, or mixture thereof, used to evaluate the performance of a protective clothing material.

3.1.8.1 *Discussion*—For the purpose of this specification, the test chemical selected is limited to a liquid chemical.

3.1.9 *toxicity, n*—propensity of a substance to produce adverse biochemical or physiological effects.

4. Classification and Test Requirements

4.1 All protective clothing complying with this specification shall fulfill the requirements of ISO 13688 and shall be tested and classified by the level of protection based on the material, seam, and garment requirements included in Sections 5-7. Information on tests to be conducted for each level of protection is included in Table 1.

4.2 Level 1 garments shall be made of materials and with seams that demonstrate a minimum liquid penetration resistance when tested in accordance with tests specified in Table 1. The mechanical strength performance requirements are the same for all levels of garments, and the garments shall pass a practical performance test.

4.3 Level 2 garments shall be made of materials and with seams that demonstrate a higher level of liquid penetration resistance than Level 1 garments. The mechanical strength performance requirements are the same for all levels. The garments shall pass a practical performance test before being submitted to a low-level spray test of the whole garment.

4.4 If, for a particular pesticide, additional testing is required to fully characterize the material (this shall be decided on the basis of the risk assessment provided for the registration of the specific pesticide), the material shall also be tested for permeation resistance using the pesticide in question. When tested with specific pesticide formulations, information regarding the test liquid shall be included in the information provided with the garment. The mechanical strength performance requirements are the same for all levels. The garments shall pass a practical performance test before being submitted to a high-level spray test of the whole garment, which is more severe than the test for Level 2 garments. Level 3 protective clothing includes accessories such as aprons, protective sleeves, and material placed below knapsack/backpack sprayers, which is used for extra protection during spraying, mixing, and loading. Whole body testing is not required for accessories worn over whole body garments.

5. Performance Requirements of Protective Clothing Materials

5.1 *Preconditioning*—All protective clothing materials or material assemblies shall undergo 30 cycles of cleaning in accordance with the manufacturer's instructions before testing, if the manufacturer's instructions indicate that the garment can be cleaned. However, garments that, in accordance with the manufacturer's instructions, can be cleaned fewer than 30 times shall undergo only as many cycles of cleaning as indicated by the manufacturer's instructions. After the last cleaning cycle, materials to be tested for penetration shall be air dried and shall not be ironed before testing.

NOTE 1—Garments do not need to be dried between wash cycles.

5.1.1 If the manufacturer requires special cleaning or maintenance conditions, this information shall be included as part of a warning label in accordance with Section 8.

NOTE 2—The purpose of the warning label is to inform the user of special requirements that, if not followed, have the potential to impact the

TABLE 1 Testing Requirements for Level 1, 2, and 3 Garments

	Specific Performance Test	Level		
		1[A]	2	3
Material Requirements	Liquid penetration resistance (Test Method F2130)	x[B]	x[B]	
	Resistance to penetration by liquid under pressure (Test Method F903)			x
	Resistance to permeation (Test Method F739)			x[C]
	Breaking strength (Test Method D5035)	x	x	x
	Tearing strength (Test Method D1424)	x	x	x
Seam requirements	Liquid penetration resistance (Test Method F2130)	x[B]	x[B]	
	Resistance to penetration by liquid under pressure (Test Method F903)			x
	Resistance to permeation (Test Method F739)			x[C]
	Breaking strength (Test Method D5034)	x	x	x
Whole garment requirements	Practical performance test	x	x	x
	Low-level spray test (ISO 17491-4, Method A)		x	
	High-level spray test (ISO 17491-4, Method B)			x

[A] Level 1 is equivalent to Level 1b of ISO 27065.
[B] The minimum performance requirement for Level 2 is considerably more severe than for Level 1 (see 5.2).
[C] If, for a particular pesticide, additional testing is required to fully characterize the material (this shall be decided on the basis of the risk assessment provided for the registration of the specific pesticide), the material shall also be tested for permeation resistance using the pesticide in question. When tested with specific pesticide formulations, information regarding the test liquid shall be included in the information provided with the garment.

protective properties of the garment. Examples of special conditions include, but are not limited to, use of a specific detergent or use of heat such as tumble dry or ironing to reactivate the repellent finish.

5.2 *Material Penetration Resistance:*

5.2.1 Penetration testing for Level 1 and Level 2 garments shall be conducted in accordance with Test Method F2130, Method A, using 0.2 mL of test chemical. The average of three percent penetration values shall be used to classify the material. If the average of three readings is within 10 % of the threshold, the test shall be repeated for an additional set of three readings, and the average of six readings shall be used to classify the material. If more than one type of material is used to construct the garment, three specimens of each material shall be tested. Prowl 3.3[4] , an emulsifiable concentrate with 37.4 % pendimethalin, diluted with distilled water to 5 % active ingredient (a.i.) shall be used. It is acceptable to substitute the test chemical as long as it has been verified that the same performance rating for materials and seams is achieved.

5.2.2 If the garment consists of a combination of separate layers of materials, all layers shall be tested together with the outer fabric exposed to the test chemical. For single-layer garments constructed from different types of materials, each material shall be tested separately and the penetration classification based on the lowest performing level.

5.2.3 Materials classified as Level 1 shall have an average penetration value ≤40 %. If the material fails to meet the requirement, Test Method F2130, Method B, an analytic method, can be used to verify the results obtained for Method A.

5.2.4 Materials classified as Level 2 shall have an average penetration value of 5 % or less. If the material fails to meet the requirement, Test Method F2130, Method B, an analytic method, can be used to verify the results obtained for Method A.

NOTE 3—It is possible that some materials, such as those with a microporous membrane, will allow water and not the a.i. to penetrate through the fabric. If bright yellow, the color of pendimethalin, is not visible on the collector layer, proceed with analytical testing using Method B.

NOTE 4—The pipette test is an accelerated laboratory test that differentiates the penetration performance of materials. The maximum allowable penetration of 40 % is derived from the pipette data analysis of cotton and cotton/polyester garment materials typically used for operator exposure studies. Therefore, it is not possible to substitute laboratory data from the pipette method for field penetration data. For this reason, the 40 % limit shall not be used to calculate default protection factors used for exposure mitigation in operator exposure and risk assessment.

5.2.5 The results shall be reported in the manufacturer's product technical information (see Section 8).

5.3 *Material Resistance to Penetration by Liquid under Pressure:*

5.3.1 Resistance to penetration by liquid under pressure for Level 3 garments shall be tested in accordance with Test Method F903. Three specimens shall be tested for each material. Use Prowl 3.3, an emulsifiable concentrate with 37.4 % pendimethalin, diluted with distilled water to 5 % a.i.. Test the specimens at 0-kPa pressure for 1 min. Then increase the pressure at increments of 1 kPa every minute until failure is observed or a maximum of 15 kPa is reached. A material meets the requirements if all three specimens pass the test at a pressure >14 kPa. It is acceptable to substitute the test chemical as long as it has been verified that the same performance rating for materials and seams is achieved.

5.3.2 If the garment consists of a combination of separate layers of materials, all layers shall be tested together with the outer fabric exposed to the test chemical. For single-layer garments constructed from different types of materials, each material shall be tested separately and the penetration classification based on the lowest performing level.

5.3.3 The results shall be reported in the manufacturer's product technical information (see Section 8).

5.4 *Material Resistance to Permeation (Alternative to Liquid Pressure Test):*

5.4.1 If, for a particular pesticide, additional testing is required to fully characterize the material (this shall be decided on the basis of the risk assessment provided for the registration of the specific pesticide), the material shall also be tested in accordance with Test Method F739. The average of the three permeation readings shall be used to determine the normalized breakthrough time (see Note 5). The test liquid shall be the specific pesticide formulation diluted with water in accordance with the manufacturer's instructions. Materials classified for Level 3 garments shall have a normalized breakthrough time >30 min for the active ingredient (see Note 6).

NOTE 5—Normalized breakthrough time will be reached when the normalized permeation rate of 1 μg/cm^2.min is achieved for an open collecting medium (break time (BT) 1.0) or the normalized permeating mass of 2.5 μg/cm^2.min is achieved for a closed collecting medium (BT 2.5).

NOTE 6—Pesticide formulations are mixtures that, when diluted in water, are often emulsions or suspensions. During the test, it is possible that agitation in the challenge test cell will be required. It is possible that selective detection systems will be required to detect the active ingredient.

NOTE 7—It is possible that the solvent in the pesticide mixture will impact permeation of the pesticide.

5.4.2 If the garment consists of a combination of separate layers of materials, all layers shall be tested together with the outer fabric exposed to the test chemical. For single-layer garments constructed from different types of materials, each material shall be tested separately and the permeation classification based on the lowest performing level.

5.4.3 The results shall be reported in the manufacturer's product technical information (see Section 8).

5.5 *Material Breaking Strength:*

5.5.1 Breaking strength of clothing materials shall be tested in accordance with Test Method D5035 and the average of five readings shall be calculated in both the machine and cross directions. The breaking strength of reusable materials shall be a minimum of 180 N in both the machine and cross directions. Materials with an elongation of more than 50 % are exempted from the 180-N requirement. For limited-use garments, the breaking strength shall be a minimum of 30 N in both the machine and cross directions.

5.5.2 If the garment consists of a combination of separate layers of materials, the outer layer shall be tested. For single-layer garments constructed from different types of materials, each material shall be tested separately.

5.5.3 The results shall be reported in the manufacturer's product technical information (see Section 8).

5.6 *Material Tearing Strength:*

5.6.1 Tearing strength of clothing materials shall be tested in accordance with Test Method D1424. The average of five readings shall be a minimum of 10 N for reusable and limited-use garments.

5.6.2 If the garment consists of a combination of separate layers of materials, the outer layer shall be tested. For single-layer garments constructed from different types of materials, each material shall be tested separately.

5.6.3 The results shall be reported in the manufacturer's product technical information (see Section 8).

6. Performance Requirements of Seams

6.1 *Preconditioning*—A specimen containing seams used in the construction of the garment shall be taken from a garment that has undergone 30 cycles of cleaning in accordance with the manufacturer's instructions before testing, if the manufacturer's instructions indicate that the garment can be cleaned. However, garments that, in accordance with the manufacturer's instructions, can be cleaned fewer than 30 times shall undergo only as many cycles of cleaning as indicated by the manufacturer's instructions. After the last cleaning cycle, materials to be tested for penetration shall be air dried and shall not be ironed before testing.

NOTE 8—Garments do not need to be dried between wash cycles.

6.1.1 If the manufacturer requires special cleaning or maintenance conditions, this information shall be included as part of a warning label in accordance with Section 8.

NOTE 9—The purpose of the warning label is to inform the user of special requirements that, if not followed, have the potential to impact the protective properties of the garment. Examples of special conditions include, but are not limited to, use of a specific detergent or heat such as tumble dry or ironing to reactivate the repellent finish.

6.2 *Seam Penetration Resistance:*

6.2.1 The testing of specimens with seams used in the construction of Level 1 and Level 2 clothing shall be conducted in accordance with Test Method F2130, Method A using 0.2 mL of test chemical. The seam shall be tested by placing the specimen such that the seam is centered along the length so that the test chemical falls directly on it. The test shall be repeated if the test chemical does not fall directly onto the seam during application. The specimen shall be discarded and the test repeated with a new specimen. All types of seams used in the construction shall be tested if more than one type of seam is used.

6.2.2 The average of three penetration readings shall be used to determine the seam performance. The criteria to measure percent penetration through the seams shall be the same as that for the material (see 5.2). The average penetration of the lowest performing seam type shall be used to determine the performance.

6.2.3 The results shall be reported in the manufacturer's product technical information (see Section 8).

6.3 *Seam Resistance to Penetration by Liquid Under Pressure:*

6.3.1 The testing of specimens with seams used in the construction of Level 3 garments shall be conducted in accordance with Test Method F903. Three specimens shall be tested for each seam. Use Prowl 3.3[4], an emulsifiable concentrate with 37.4 % pendimethalin, diluted with distilled water to 5 % a.i. Test the specimens at 0 kPa pressure for 1 minute. Then increase the pressure at increments of 1 kPa every minute until failure is observed or a maximum of 15 kPa is reached. A seam meets the requirements if all three specimens pass the test at a pressure >14 kPa. It is acceptable to substitute the test chemical as long as it has been verified that the same performance rating for materials and seams is achieved. All types of seams used in the construction shall be tested if more than one type of seam is used.

6.3.2 The results shall be reported in the manufacturer's product technical information (See Section 8).

6.4 *Seam Resistance to Permeation (Alternative to Liquid Pressure Test):*

6.4.1 If, for a particular pesticide, additional testing is required to fully characterize the material (this shall be decided on the basis of the risk assessment provided for the registration of the specific pesticide), the material shall also be tested in accordance with Test Method F739. The average of the three permeation readings shall be used to determine the normalized breakthrough time (see Note 10). The test liquid shall be the specific pesticide formulation diluted with water in accordance with the manufacturer's instructions. Materials classified for Level 3 garments shall have a normalized breakthrough time >30 minutes for the active ingredient (See Note 11). All types of seams used in the construction shall be tested if more than one type of seam is used, and the lowest performing seam type shall be used to determine the performance.

NOTE 10—Normalized breakthrough time will be reached when the normalized permeation rate of 1 $\mu g/cm^2$.min is achieved for an open collecting medium (BT 1.0) or the normalized permeating mass of 2.5$\mu g/cm^2$.min is achieved for a closed collecting medium (BT 2.5).

NOTE 11—Pesticide formulations are mixtures that, when diluted in water, are often emulsions or suspensions. During the test, it is possible that agitation in the challenge test cell will be required. It is possible that selective detection systems will be required to detect the active ingredient.

NOTE 12—It is possible that the solvent in the pesticide mixture will impact permeation of the pesticide.

6.4.2 The results shall be reported in the manufacturer's product technical information as specified in Section 8.

6.5 *Seam Strength:*

6.5.1 A sample of each type of straight seam construction shall be tested in accordance with Test Method D5034. The seam strength of the outer material shall be at least 150 N. Materials with an elongation of more than 50 % are exempted from the 150-N requirement. If more than one type of seam is used to construct the garment, the seams shall be classified according to the level of performance of the lowest measured seam strength for all types of seams tested. The results shall be reported in the manufacturer's product technical information (see Section 8).

[4] The sole source of supply of Prowl 3.3 known to the committee at this time is Testfabrics, Inc. at http://www.testfabrics.com. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

7. Performance Requirements of Garments

7.1 *Preconditioning*—All garments shall undergo 30 cycles of cleaning in accordance with the manufacturer's instructions before testing, if the manufacturer's instructions indicate that the garment can be cleaned. However, garments that, in accordance with the manufacturer's instructions, can be cleaned fewer than 30 times shall undergo only as many cycles of cleaning as indicated by the manufacturer's instructions. After the last cleaning cycle, materials to be tested for penetration shall be air dried and shall not be ironed before testing.

NOTE 13—Garments do not need to be dried between wash cycles.

7.1.1 If the manufacturer requires special cleaning conditions, this information shall be included as part of a warning label in accordance with Section 8.

NOTE 14—The purpose of the warning label is to inform the user of special requirements that, if not followed, have the potential to impact the protective properties of the garment. Examples of special conditions include, but are not limited to, use of a specific detergent or heat such as tumble dry or ironing to reactivate the repellent finish.

7.2 *Practical Performance:*

7.2.1 Garment inspection and the practical performance test shall be performed on two separate garments or protective suits. Once inspected, the garments shall be tested for practical performance using the procedure specified in Annex A1, which is identical to the procedure written as Procedure C of ISO 16602, Annex A.3. Protective clothing shall meet the following criteria:

7.2.1.1 The protective garment shall have no design feature (for example, sleeve plackets) that would allow the pesticide products, against which the garment is intended to offer protection, to penetrate through the garment. Outside pockets are allowed only if it is ensured that the pesticide products cannot penetrate or adhere to the pockets.

NOTE 15—Outside pockets with drain gutter, flap, or perforation are possible designs that fulfill the requirement.

7.2.1.2 Protective garments shall not restrict the test subject from performing any task.

7.2.1.3 The garment closures shall be fully secured. During the duration of the test, there shall be no gaps or openings between closures that might have the potential to allow liquid penetration.

7.2.1.4 If the test subject is not able to perform one or several movements because of the hindrance of the garment, if the movements result in substantial damage to the garment, or if the garment closures do not remain secure for the duration of the test, the garment shall fail the practical performance test and no further testing shall be conducted.

7.2.1.5 Any other comments, including those regarding garment comfort volunteered by the wearer during the practical performance testing, shall be recorded. A negative comment does not constitute a failure of this test.

7.2.2 The practical performance procedure specified in Annex A1 also serves to precondition for the high- and low-level spray tests in accordance with ISO 17491-4. Therefore, if applicable, the test subject shall proceed to spray testing upon successful completion of the practical performance test.

7.3 *Liquid Penetration Resistance:*

7.3.1 *Low-Level Spray Test*—Level 2 garments shall be conditioned by wearing in accordance with the procedure specified in Annex A1 and subsequently tested for liquid penetration resistance using a spray test in accordance with ISO 17491-4, Method A. The garment shall show no penetration greater than three times the total calibrated stain area. This whole garment liquid penetration resistance testing shall be performed on two garments using a separate test subject for each test. Each garment shall pass the test.

7.3.1.1 The results shall be reported in the manufacturer's product technical information as specified in Section 8.

7.3.2 *High-Level Spray Test*—Level 3 garments shall be conditioned by wearing in accordance with the procedure specified in Annex A1 and subsequently tested for liquid penetration resistance using a spray test in accordance with ISO 17491-4, Method B. The garment shall show no penetration greater than three times the total calibrated stain area. This whole garment liquid penetration resistance testing shall be performed on two sample garments using a separate test subject for each test.

7.3.2.1 The results shall be reported in the manufacturer's product technical information as specified in Section 8.

8. Marking and Information Supplied by the Manufacturer

8.1 The garment shall be supplied to the customer together with information supplied by the manufacturer at least in the official language(s) of the country where it is being sold. Instruction sheets shall provide the information for limited-use garments. Permanent labels shall be used to provide information for reusable garments.

8.2 *Labeling*—The protective garment shall include a label that shall be permanently attached in a conspicuous location and shall include at least the following information in letters at least 1.5 mm high:

8.2.1 Name, trademark, or other means for identifying the manufacturer;

8.2.2 Manufacturer's identification or model number for the suit or clothing;

8.2.3 Reference to this ASTM specification followed by the level of protective clothing (Level 1, Level 2, or Level 3 in accordance with requirements in Table 1);

8.2.4 Size designation in accordance with the regulations for the country in which the garment is sold;

8.2.5 Care instructions in accordance with the regulations for the country or region in which the garment is sold;

8.2.6 Year of manufacture and also the month of manufacture if the expected shelf life of the clothing is less than 24 months. It is acceptable to mark this information on every commercial packaging unit instead of marking every item of clothing; and

8.2.7 A warning placed prominently alerting the user of any special cleaning or maintenance conditions that, if not followed, have the potential to impact the protective properties of the garment. Examples of special conditions include, but are not limited to, use of a specific detergent or heat such as tumble dry or ironing to reactivate the repellent finish.

8.3 *Instructions for Use*—The manufacturer shall provide instructions with every garment or shall alternatively provide instructions with at least every commercial packaging unit. The purpose is to guarantee that the wearer sees these instructions. The instructions shall contain the information given on the label and at least the following information, as applicable:

8.3.1 Manufacturer's recommendations on the number of times the garment can be worn, if applicable;

8.3.2 If applicable, retirement criteria such as end-of-life indicators (for example, measuring repellency by applying drops of a liquid supplied with the garment);

8.3.3 Instructions to remove the garment immediately if contaminated by concentrate spill;

8.3.4 Expected shelf life if aging can occur;

8.3.5 Warning of potential for heat stress and information to assist the user in making decisions regarding selection and use of the garment, if applicable;

8.3.6 Limitations of use including conditions or factors that significantly reduce the protective qualities of the protective clothing;

8.3.7 Don/doffing procedures, if applicable;

8.3.8 Information regarding inspection including visual inspection for tear and abrasion before each use;

8.3.9 Cleaning and decontamination instructions and precautions as specified by the manufacturer and a statement advising users not to use garments that are not thoroughly cleaned and dried;

8.3.10 Instructions regarding repair if repair of mechanical damage is permitted by the manufacturer;

8.3.11 Disposal requirements; and

8.3.12 Warnings, if appropriate, to provide information about possible problems with the use of the clothing or for misuse in unsuitable environments.

8.4 *Product Technical Information:*

8.4.1 Upon the request of the purchaser, the manufacturer shall make available all test results and classifications required by this specification. It is acceptable to combine this information with the instructions for use (see 8.3). A complete description of the product shall be given as to materials, component parts, and assemblies.

8.4.2 *Chemical Resistance Information*—All penetration test data shall be provided in a table for each material or seam tested. These data shall include a list of chemicals and chemical products (specifying the chemicals and their concentrations) against which the materials have been tested or a reference to where this information can be obtained (for example, manufacturer's telephone/fax number).

9. Keywords

9.1 pesticide; protective clothing

ANNEX

A1. TEST SUBJECT EXERCISES FOR PRACTICAL PERFORMANCE EVALUATION

A1.1 *Procedure*—The following activities, which are identical to Procedure C of ISO 16602, Annex A.3, shall be performed as part of a practical performance evaluation as well as an evaluation of the garment for gapping and design requirements.

A1.1.1 A practical test shall be carried out by a human test subject in an atmosphere of 25 ± 5ºC and a relative humidity of 60 ± 10 %. If more than one size of protective clothing is manufactured, the test subject will be asked to select the appropriate size in accordance with the manufacturer's information leaflet.

A1.1.2 The test shall comprise three repetitions, at moderate speed, of the "seven movements" sequence described in the following:

A1.1.2.1 Starting from a standing position in each case, carry out the following movement sequence:

Movement 1—Kneel on both knees, lean forward, and place both hands on the floor 45 ± 5 cm in front of the knees; crawl forward and backward on hands and knees for a distance of 3 m in each direction;

Movement 2—Climb a vertical ladder at least four steps, rungs to be as encountered on a typical ladder;

Movement 3—Position hands at chest level, palms out; reach directly overhead, interlock thumbs, and extend arms fully upwards;

Movement 4—Kneel on right knee, place left foot on floor with left knee bent 90 ± 10°; touch thumb of right hand to toe of left shoe. Repeat movement with alternate posture, that is, by kneeling on left knee and placing the right foot on the floor with knee bent at 90°;

Movement 5—Extend arms fully in front of body, lock thumbs together, and twist upper body 90 ± 10° left and right;

Movement 6—Stand with feet shoulder width apart, arms at side; raise arms until they are parallel to the floor in front of the body; squat down as far as possible; and

Movement 7—Kneel as in *Movement 4*, left arm hanging loosely at side; raise arm fully overhead. Repeat movement with alternate posture by alternating arms.