



The NAHEMS Guidelines: Personal Protective Equipment recommends use of Level C protection during an HPAI response. The *Highly Pathogenic Avian Influenza Standard Operating Procedures: 8. Health and Safety Personal Protective Equipment*, states that the Site Safety Officer (SSO), or designee, selects which PPE to use for individual tasks based on the job hazard analysis (JHA) performed. The purpose of this document is to provide greater detail to Safety Officers on the selection of PPE within Level C. Job hazard analyses should be conducted to determine the best fabric to protect against specific liquid splashes. In general, select the lowest level of fabric which provides sufficient protection to personnel. "Product Line by Hazard" provides comparisons and recommendations for typical chemical hazards.<sup>1</sup> In addition to respiratory protection and full-body protection, appropriate foot and hand protection must be worn.<sup>2</sup> For more information, please contact Deborah.I.Nelson@aphis.usda.gov at 515-450-6096.

Type of PPE	Protective Suit Fabric <sup>3</sup>						Respiratory Protection <sup>4</sup>		
	SMS (aka Proshield)	Microporous (laminates)	*Tyvek® (spun-bonded olefin such as polyethylene)	*Tychem® QC (Tyvek coated with polyethylene)	Tychem® SL, utilizing Saranex® 23-P film laminated to Tyvek®	*Tychem® F, proprietary barrier material	Single-use filtering facepiece available from the NVS	Half-facepiece air-purifying respirator with replaceable filter/cartridges	Full-facepiece air-purifying respirator with replaceable filter/ cartridges
General Description	<ul style="list-style-type: none"> <li>◆ "Good for particulates -- 50% holdout" (per Dupont representative)</li> <li>◆ "A breathable fabric that offers a good barrier against hazardous particles and limited liquid splashes."<sup>5</sup></li> <li>◆ NOTE: Will not provide as much protection as Tyvek® from objects or surfaces that could damage or tear the fabric.</li> </ul>	<ul style="list-style-type: none"> <li>◆ "Better for particulates -- 95 to 97% holdout" (per Dupont representative)</li> <li>◆ "Microporous PE Laminate offers a good barrier against hazardous particles and light liquid splashes, while the micropores allow for some breathability."<sup>6</sup></li> <li>◆ See NOTE under SMS.</li> </ul>	<ul style="list-style-type: none"> <li>◆ "Best for particulates " (per Dupont representative)</li> <li>◆ "Light-weight inherent barrier protection against hazardous dry particles and aerosols, and nonhazardous light liquid splash"<sup>7</sup></li> </ul>	<ul style="list-style-type: none"> <li>◆ "...used for light splash protection in a variety of industrial environments ...provides excellent resistance against biohazards such as blood, body fluid, and viral contaminants ..."<sup>8</sup></li> </ul>	<ul style="list-style-type: none"> <li>◆ "Chemical mixing, remediation, emergency medical response, paint spraying, and radioactive environments."<sup>9</sup></li> </ul>	<ul style="list-style-type: none"> <li>◆ "...strong, lightweight liquid splash protection ... for personnel responding to an incident involving chemical, biological, or radioactive agents ..."<sup>10</sup></li> </ul>	<ul style="list-style-type: none"> <li>*N95 3M 8110 3M 8210 3M 8511 3M 9211+ Moldex 2700</li> <li>*P95 3M 8271</li> <li>*N100 3M 8233 3M 8293 Moldex 2360</li> </ul>	<ul style="list-style-type: none"> <li>◆ The minimum requirement is P100 filters; additional protection may be needed for organic vapors and/or ammonia.</li> <li>◆ NOTE that organic vapor cartridges do NOT protect against ammonia unless specifically stated on the label.</li> <li>◆ OSHA Assigned Protection Factor = 10.</li> </ul>	<ul style="list-style-type: none"> <li>◆ The minimum requirement is P100 filters; additional protection may be needed for organic vapors and/or ammonia.</li> <li>◆ NOTE that organic vapor cartridges do NOT protect against ammonia unless specifically stated on the label.</li> <li>◆ OSHA Assigned Protection Factor = 50.</li> </ul>

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	♦ Additional PPE (e.g., safety gloves with gauntlets) may be needed.							♦ <u>*½-facepieces</u> (all in S, M, and L) North 7700 MSA Advantage 420 3M 6000 Series Survivair 2000S Series	♦ <u>*Full-facepieces</u> MSA Advantage 1000 (S, M, L) North 7600 Series (S, M/L) 3M 6000 Series (S, M, L)
Contribution to WBGT <sup>11</sup>	+0.5°C = +0.9°F	(should be between SMS and Tyvek)	+1°C = +1.8°F	+11°C=+19.8°F (applicable to vapor-barrier coveralls)			N/A	N/A	N/A
Activities with low-to-moderate exposure to dry airborne particles (e.g., environmental monitoring, shoveling, compost heaps, dry cleaning with hand tools); low potential of splashing or soaking	Acceptable	Acceptable	Acceptable	Not indicated for use against particulates unless there is exposure to splashing of hazardous liquids or continual exposure to irritating liquids	Not indicated for use against particulates unless there is exposure to splashing of hazardous liquids or continual exposure to irritating liquids	Not indicated for use against particulates unless there is a high risk of exposure to chemical, biological, and/or radioactive agents	Acceptable	Acceptable	Acceptable
Activities with moderate-to-high potential of exposure to aerosols, such as produced by use of compressed air or water spray <sup>12</sup>	Not appropriate	Not appropriate	Not appropriate	Appropriate if indicated by job hazard analysis.	Appropriate if indicated by job hazard analysis.  "If during any of the high contact activities, especially cleaning, disinfecting and decontaminating, exposure to	Appropriate if indicated by job hazard analysis.	Not appropriate	Acceptable with appropriate eye protection <sup>14</sup>	Recommended; eye protection integral to facepiece

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					moderate-to-large volumes of liquid is anticipated, a sealed seam Tychem® garment may be appropriate to reduce the risk of liquid contact. <sup>13</sup>				
Activities with high potential of splashing or soaking, especially with irritating or hazardous liquids <sup>15</sup>	Not acceptable	Not acceptable	Not acceptable	Job hazard analysis should be conducted to determine the best fabric to protect against specific liquid splashes. In general, select the lowest level of fabric which provides sufficient protection to personnel. "Product Line by Hazard" provides recommendations for typical chemical hazards. <sup>16</sup>			Not acceptable	Acceptable with appropriate eye protection	Recommended

\*Available through the National Veterinary Stockpile.

<sup>1</sup> Product Line by Hazard, DuPont, [http://safespec.dupont.com/safespec/media/documents/hazard\\_matrix.pdf](http://safespec.dupont.com/safespec/media/documents/hazard_matrix.pdf)

<sup>2</sup> Select foot protection which can be disinfected, and which provides protection from hazards such as objects piercing the sole (e.g., nails), slippery ground and floors, and falling or rolling objects. The best protection will be provided by cleanable, treaded pull-on overboots (e.g., Servus A380 yellow overboots) worn over sturdy work boots or shoes.

Gloves must be selected to protect against the chemicals in use (e.g., pesticides, solvents, etc.). A combination of glove types worn in layers may be needed to protect against biological and chemical hazards, and against rough surfaces or objects such as nails or protruding wires, which may damage the glove. Gauntlet gloves may be helpful for tasks such as reaching into cages. Consult the Safety Data Sheets for each chemical or <http://www.cdc.gov/niosh/ncpc/> for further guidance.

<sup>3</sup>Items marked with an asterisk (\*) are currently available through the National Veterinary Stockpile: Tyvek®, Tychem® QC, and Tychem® F, and all indicated respirator models. Other fabric types are presented for comparison, in order of increasing protection. Higher rated fabrics are commercially available if deemed necessary. Gloves must be selected to protect against the chemicals in use (e.g., pesticides, solvents, etc.). A combination of glove types worn in layers may be needed to protect against biological and chemical hazards, and against surfaces or objects which may damage the glove.

<sup>4</sup> Please note that individual state requirements may vary (for example, California requirements available at <http://www.dir.ca.gov/Title8/5199-1.html>).

<sup>5</sup> 3M Protective Apparel Product Guide, 3M, 2012.

<sup>6</sup> 3M Protective Apparel Product Guide, 3M, 2012.

<sup>7</sup> Tyvek® Coveralls, <http://www.dupont.com/products-and-services/personal-protective-equipment/chemical-protective-garments/brands/tyvek-protective-apparel/products/tyvek-coveralls.html>, accessed 27 June 2015.

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<sup>8</sup> DuPont Tychem® QC Chemical Protective Clothing, [http://www2.dupont.com/Personal\\_Protection/en\\_US/assets/downloads/tychem/K17394TychemQC.pdf](http://www2.dupont.com/Personal_Protection/en_US/assets/downloads/tychem/K17394TychemQC.pdf), accessed 20 July 2015.

<sup>9</sup> DuPont Technical Data Sheet, DuPont™ Tychem® SL Lightweight Protection of DuPont® Tyvek® Laminated with a Chemical-Resistant Saranex® Film, [http://www2.dupont.com/Personal\\_Protection/en\\_US/assets/downloads/tychem/h91469tychemsltechdata.pdf](http://www2.dupont.com/Personal_Protection/en_US/assets/downloads/tychem/h91469tychemsltechdata.pdf), accessed 27 June 2015.

<sup>10</sup> DuPont Tychem F, [http://www2.dupont.com/Personal\\_Protection/en\\_US/assets/downloads/tychem/h95939tychemftechdata.pdf](http://www2.dupont.com/Personal_Protection/en_US/assets/downloads/tychem/h95939tychemftechdata.pdf).

<sup>11</sup> Per ACGIH® TLV for Heat Stress and Heat Strain, 2015.

<sup>12</sup> OSHA requires in 1910.242 Hand and portable powered tools and other hand-held equipment, paragraph (b), "Compressed air used for cleaning. Compressed air shall not be used for cleaning purposes except where reduced to less than 30 p.s.i. and then only with effective chip guarding and personal protective equipment."

<sup>13</sup> "Protective Clothing for Avian Flu," DuPont, 2013, accessed 27 June 2015 at [http://safespec.dupont.com/safespec/media/documents/avian\\_flu.pdf](http://safespec.dupont.com/safespec/media/documents/avian_flu.pdf).

<sup>14</sup> OSHA requires in 1910.133 Eye and face protection, paragraph (a)(1): "The employer shall ensure that each affected employee uses appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation." A combination of eye/face protection may be required to protect against impact, dust, and chemicals. Single-use filtering facepieces and half-mask (elastomeric) air-purifying respirators provide no eye protection. Full facepiece elastomeric respirators provide some eye protection for infection control, which "...because of their design incidentally provide highly effective eye protection as well."

OSHA's e-tool on eye protection (<https://www.osha.gov/SLTC/etools/eyeandface/ppe/selection.html>) provides the following guidance:

#### Impact

While working in a hazardous area where the worker is exposed to flying objects, fragments, and particles, primary protective devices such as safety spectacles with side shields or goggles must be worn. Secondary protective devices such as face shields are required in conjunction with primary protective devices during severe exposure to impact hazards.

Personal protective equipment devices for impact hazards:

- ◆ [Safety Spectacles](#): Primary protectors intended to shield the eyes from a variety of impact hazards.
- ◆ [Safety Goggles](#): Primary protectors intended to shield the eyes against flying fragments, objects, large chips, and particles.
- ◆ [Face Shields](#): Secondary protectors intended to protect the entire face against exposure to impact hazards.

#### Dust

... Working in a dusty environment can cause eye injuries and presents additional hazards to contact lens wearers.

Either eyecup or cover-type safety goggles should be worn when dust is present. Safety goggles are the only effective type of eye protection from nuisance dust because they create a protective seal around the eyes.

Personal protective equipment devices for dust hazards:

- ◆ [Safety Goggles](#): Primary protectors intended to protect the eyes against a variety of airborne particles and harmful dust.

#### Chemicals

A large percentage of eye injuries are caused by direct contact with chemicals. These injuries often result from an inappropriate choice of personal protective equipment, that allows a chemical substance to enter from around or under protective eye equipment. Serious and irreversible damage can occur when chemical substances contact the eyes in the form of splash, mists, vapors, or fumes. When working with or around chemicals, it is important to know the location of [emergency eyewash stations](#) and how to access them with restricted vision. When fitted and worn correctly, goggles protect your eyes from hazardous substances. A face shield may be required in areas where workers are exposed to severe chemical hazards.

Personal protective equipment devices for chemical hazards:

- ◆ [Safety Goggles](#): Primary protectors intended to shield the eyes against liquid or chemical splash, irritating mists, vapors, and fumes.
- ◆ [Face Shields](#): Secondary protectors intended to protect the entire face against exposure to chemical hazards.

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<sup>15</sup> OSHA requires in 29 CFR 1010.151 *Medical services and first aid, Paragraph (c)*: “Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.” OSHA does not further specify the type of eye wash fountain, but has stated that “While not having the force of a regulation under the OSH Act, the current ANSI standard addressing emergency eyewash and shower equipment (ANSI Z358.1-2004) provides for eyewash and shower equipment in appropriate situations when employees are exposed to hazardous materials.” ([https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=INTERPRETATIONS&p\\_id=27089](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=27089)). The ANSI standard requires that eye wash fountains deliver 0.4 gallons per minute for 15 minutes (equivalent to 6 gallons of potable water or other medically acceptable fluid). These facilities should be located within 55’ or 10-second travel time, without barriers or steps to impede travel. Employees must also be trained on chemical hazards (29 CFR 1910.1200, Hazard communication, specifically 29 CFR 1910.1200(h) Employee information and training).

<sup>16</sup> Product Line by Hazard, DuPont, [http://safespec.dupont.com/safespec/media/documents/hazard\\_matrix.pdf](http://safespec.dupont.com/safespec/media/documents/hazard_matrix.pdf) .