

ARC FLASH SUITS



1. Scope

This material standard covers the requirements for bright orange, arc flash suits.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Size
013229	Medium (M)
013230	Large (L)
013231	Extra-large (XL)
013232	Double extra-large (2X)
013233	Triple extra-large (3X)
013234	Four extra-large (4X)
013235	Five extra-large (5X)

Accessories worn with arc flash suits are outside the scope of this standard.

2. Application

Arc flash suits (with special accessories) are worn to protect employees from known arc flash hazards and

maintain state and federal compliance. Arc flash suits also offer protect against liquid chemical splash.

Employees must be trained prior to using arc flash suits and accessories. Contact Seattle City Light Safety & Health for details.

Detailed application and procedural information may be found in Seattle City Light, Department Policy & Procedure (DPP) **Number DPP 500 P**, Arc Flash Electrical Safety, *Draft*. Up to the time this DPP becomes final, Contact Seattle City Light Safety & Health for a copy of the latest draft.

Arc flash suits are considered reusable.

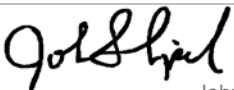
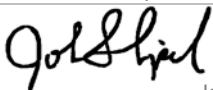
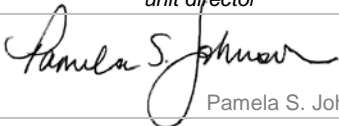
Arc flash protection accessories are covered in Material Standard 4013.31.

3. Industry Standard

Arc flash suits shall meet the applicable requirements of the industry standards cited in DuPont Personal Protection, Technical Data Package, DuPont Tychem ThermoPro Garments, TP198T, TP199T, **K-23401** 03/10.

4. Attributes

Color: Bright orange

standards coordinator	standards supervisor	unit director
 John Shipek	 John Shipek	 Pamela S. Johnson

4. Attributes, continued

DuPont Personal Protection



This information packet may not be removed except by the end user

K-23401 03/10

Technical Data Package

DuPont™ Tychem®
ThermoPro Garments

TP198T, TP199T

Compliant with
Requirements of
NFPA 1992,
2005 Edition
&
NFPA 2112,
2007 Edition

Consult the Tychem® User Manual
for additional Instructions on Use



The miracles of science™

4. Attributes, continued**Technical Data Package****Tychem[®] ThermoPro**

**Compliant with
NFPA 1992, 2005 Edition
NFPA 2112, 2007 Edition**

**Consult the Tychem[®] User Manual for Instructions on Use
and the DuPont[™] Tychem[®] Accessories List**

Model TP198T—hooded coverall; respirator fit; draw string hood; elastic wrist; hemmed ankles; front zipper; double storm flap, fastened by flame resistant treated polyamide hook-and-loop material, high contrast orange or low visibility gray.

Model TP199T—hooded coverall; respirator fit; draw string hood; elastic wrist; attached socks; boot-top cover; front zipper; double storm flap fastened by flame resistant treated polyamide hook-and-loop material, high contrast orange or low visibility gray.

This garment is acceptable under OSHA 29 CFR 1910.269, *Occupational Safety and Health Standards for Electric Power Generation, Transmission, and Distribution*. For electric arc hazard exposures, wear the proper arc rated garment system as dictated by an electric arc hazard analysis. The arc rating of this garment is 15.2 cal/cm² E_{bt}.

WARNING: This garment is inherently flame-resistant and is intended to provide liquid chemical splash protection and to minimize burn injury during short term and emergency exposure to flame or electric arc. The wearer should try to remove themselves as quickly as possible from the area where the fire or electric arc has occurred to minimize burn injury. Do not use for protection against continuous thermal loads, molten metal splash, hot liquids, or steam. Do not wear for structural or proximity fire fighting.

CAUTION:

- Discard the garment if it has been damaged, altered or contaminated.
- Do not wear garments containing flammable or meltable fabrics over this garment.
- For fire and arc hazard situations, undergarments made with flame resistant fibers such as Nomex[®] or non-melting fibers such as cotton, silk, wool, or rayon should be worn.
- Garment should be loose fitting and provide adequate mobility for the intended use.
- All closures must be fully secured and sleeves and pant legs must extend to fully cover wrists and ankles.

4. Attributes, continued

Tychem[®] ThermoPro garments are constructed of a proprietary fabric developed by DuPont for this application. There are no replaceable components on these garments. There are no other options available on these garments. Separate user-supplied respiratory protection, additional eye and face protection as needed, gloves, boots, and head protection should be worn with this garment. These garments are not an ensemble, encapsulating or non-encapsulating, as defined by NFPA 1992. These garments do not include visor or gloves. Both models must be worn with separate, user-supplied boots. Model TP199T has chemically resistant socks attached to the garment, but these socks do not provide physical protection to the foot. Model TP198T does not provide chemical barrier or physical footwear protection.

Garments are available in sizes Medium (M), Large (L), Extra Large (XL), Double Extra Large (2X), Triple Extra Large (3X), Four Extra Large (4X) and Five Extra Large (5X). See sizing chart in the Tychem[®] User Manual selection criteria based on height and weight. The sizing chart assumes normal work clothing worn underneath. An MSA V-Gard[®] helmet was utilized during the testing for compliance with the requirements of NFPA 1992. The Tychem[®] ThermoPro garment closures consist of a 32 inch zipper (28 inch in size medium) with metal teeth set in a web of NOMEX[®] fabric. The closure is covered by two storm flaps made of garment material. The outer storm flap is fastened with hook-and-loop material made from flame resistant treated polyamide. The hood draw string is made from NOMEX[®] and KEVLAR[®] fiber. The garments seams are sewn with thread made of NOMEX[®] fibers. The seams are sealed with hot-air-welded tape.

Performance Requirements of NFPA 2112, *Standard on Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire, 2007 Edition*

Section	Description	Requirement	Tychem [®] ThermoPro
7.1.1	Contact TPP	> 3.0 cal/cm ²	17 cal/cm ²
	Spaced TPP	> 6.0 cal/cm ²	20 cal/cm ²
7.1.2	Vertical Flammability Char Length	< 4 in.	0.65 in. MD 1.87 in. CD
	Vertical Flammability Afterflame	< 2 sec.	0 sec. MD 0 sec. CD
	Melt and Drip	No observed melt drip during vertical flame test	No observed melt or drip
7.1.3	Thermal Shrinkage MD/CD	< 10%	8.3%/8.3%
7.1.4	Component Heat Resistance, 500° F	No drip	No drip
		No melt	No melt
		No ignition	No ignition
		No separation	No separation
7.1.5	Manikin Flash Fire Test	< 50% predicted body burn	14 %
7.2	Thread Heat Resistance, 500° F	No melting	No melting
7.3	Hardware Heat Resistance, 500° F	No drip	No drip
		No melt	No melt
		No ignition	No ignition
		No separation	No separation
7.4	Label Legible after Conditioning	Legible	Legible

4. Attributes, continued**Design and Performance Requirement of NFPA 1992, *Standard on Liquid-Splash Protective Ensembles and Clothing for Hazardous Materials Emergencies, 2005 Edition*****Chapter 6 – Design Requirements**

Section	Requirements	Tychem® ThermoPro
6.1 Protective Garment Elements and Items Design Requirements		
6.1.1	Liquid splash-protective garments shall be designed and configured to protect the wearer's torso, arms, and legs.	Compliant
6.1.2	Where used, booties shall be designed as an extension of the garment leg and shall cover the entire foot and ankle.	Compliant
6.1.3	Liquid splash-protective garments shall be offered in at least four unique and different sizes.	Compliant
6.1.4	All external fittings shall be free of rough spots, burrs, or sharp edges that could tear primary materials.	Compliant
6.2 Protective Glove Elements and Items Design Requirements		Not Applicable
6.3 Protective Footwear Elements and Items Design Requirements		Not Applicable
6.4 Non-encapsulating Ensemble Design Requirements		Not applicable
6.5 Encapsulating Ensemble Design Requirements		Not applicable
6.6 Optional Chemical Flash Fire Protection Design Requirements		Not applicable

Chapter 7 – Performance Requirements

Section	Description	Requirement	Tychem® ThermoPro
7.1 Protective Garment Elements and Items			
7.1.1	Liquid-tight Integrity (note: the hood to respirator seal and sleeve to glove seals)	No observed leakage inside the garment and on the indicator garment	No observed leakage
7.1.2	Simulated work activities	Complete all tasks in 15 minutes	Compliant
	Liquid-tight Integrity after garment is exercised (note: the hood to respirator seal and sleeve to glove seals)	No observed leakage inside the garment and on the indicator garment after exercise	No observed leakage
	Garment Closure Performance	Closure remains closed during simulated work	Compliant
7.1.2.1	Accommodates head protection during simulated work activities	Use ANSI Z89.1 compliant head protection	Compliant
7.1.2.2	Visor optical Clarity	Visual acuity >20/35	Not applicable- no visor
7.1.2.3	Protective flap over closure	Flap remains	Compliant

4. Attributes, continued

		closed during simulated work	
7.1.3	Garment material resist penetration by acetone, acetonitrile, ethyl acetate, hexane, 50% sodium hydroxide, 93.1% sulfuric acid, tetrahydrofuran	No observed penetration after 1 hour per ASTM F 903, Method Procedure C	No observed penetration
7.1.4	Garment material burst strength	> 135N	697 N
7.1.5	Garment material puncture propagation tear	> 25 N MD & CD	386 N MD 383 N CD
7.1.6	Garment material cold flex at – 13° F and 60° angular deflection	< 0.68 N-m MD & CD	0.020 N-m MD 0.021 n-m CD
7.1.7	Garment Visor Requirements		Not applicable
7.1.8	Garment Seam Requirements		
7.1.8.1	Garment seams resist penetration by 100% isopropanol and 93.1% sulfuric acid	No observed penetration after 1 hour per ASTM F 903, Method Procedure C	No observed penetration
7.1.8.2	Garment seam strength	> 67N/50mm	178 N/ 50 mm
7.1.9 Garment Closure Assembly Requirements			
7.1.9.1	Closure Penetration if no protective flap by 100% isopropanol and 93.1% sulfuric acid	No observed penetration after 1 hour per ASTM F 903, Method Procedure C	No Applicable – closure protective flap present
7.1.9.2	Closure Strength	> 67N/50mm	88 N/50 mm
7.2 Protective Glove Element Performance Requirements			Not applicable
7.3 Protective Footwear Element Performance Requirements			Not applicable
7.4 Non-encapsulating Protective Ensemble Performance Requirements			Not applicable
7.5 Encapsulating Protective Ensemble Performance Requirements			Not applicable
7.6 Optional Chemical Flash Fire Escape Protective Performance Requirements			Not applicable

Product safety information available upon request. This information corresponds to our current knowledge on this subject. It is offered solely to provide possible suggestions for your determination. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user's responsibility to determine the level of risk and the proper protective equipment needed for the user's particular purpose. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DUPONT MAKES NO WARRANTIES AND ASSUMES NO LIABILITY IN CONNECTION WITH ANY USE OF THIS INFORMATION. Nothing in this publication is to be considered as a license to operate in or a recommendation to infringe any trademark or patent rights.

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MATERIAL STANDARD

Arc Flash Suits

standard number: **4013.29**

superseding: new
 effective date: March 23, 2011
 page: 7 of 7

5. Tests and Test Reports

Arc flash suit test data that establishes compliance with the requirements of this material standard shall be provided upon request.

6. Packaging

Arc flash suits shall be packaged to prevent damage during shipping, handling, and storage.

Arc flash suits shall be packaged 2 per case.

Each shipping container shall be marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

7. Issuance

Stock Unit: EA

8. Approved Manufacturer

Stock Number	Size	DuPont Catalog Numbers
013229	Medium (M)	TP199TORMD000200
013230	Large (L)	TP199TORLG000200
013231	Extra-large (XL)	TP199TORXL000200
013232	Double extra-large (2X)	TP199TOR2X000200
013233	Triple extra-large (3X)	TP199TOR3X000200
013234	Four extra-large (4X)	TP199TOR4X000200
013235	Five extra-large (5X)	TP199TOR5X000200

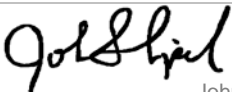
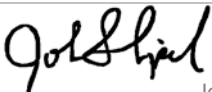
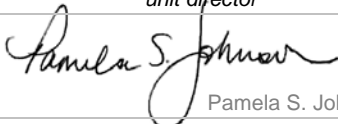
9. References

Number DPP 500 P, "Arc Flash Electrical Safety"; *Draft* Version 1.4; City Light, Department Policy & Procedure (DPP); City of Seattle; *Draft* date January 24, 2011

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www.dupont.com

www.dupontcatalog.com/personal protection

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