DEMRON™ ICE

DEMRON ICE MULTI USE SUIT

With Patented Self-Cooling Fabric Provides Highest Protection from Viral, Biological, Chemical Threats and Heat Stress

ISO **9001**
ISO **13485**
ISO **8194**
CERTIFIED

RST Radiation Shield Technologies

Tel 866.7DEMRON • www.RadShield.com

RADIATION SHIELD TECHNOLOGIES (RST) DEVELOPS DEMRON ICE FOR MIAMI DADE FIRE RESCUE AND IT WAS DEPLOYED IN A JOINT CHEMICAL BIOLOGICAL RADIOLOGICAL AND NUCLEAR (CBRN) EXERCISE WITH MDFRD AND US ARMY RESERVES

MIAMI – U.S. Army Reserve Soldiers, National Guard, Miami-Dade Fire Rescue Department ("MDFRD"), several local law enforcement agencies and PortMiami authorities partnered together to train for something each hope to never put into action.

"I couldn't think of a better training environment than one of the busiest ports," said Lt. Alvaro Tonanez, the HAZMAT lead trainer for one of the largest fire departments in America, with more than 3,000 personnel assigned to MDFRD. "To put our firefighters and the Army Reserve unit into a realistic scenario where we could use the assistance in a real-world situation is a win-win for both sides."

Sponsored by Department of Defense's U.S. Northern Command and hosted by the MDFRD, the hazardous material exercise was the second joint-training event between a large municipality and the Defense CBRN Force, according to Thomas Frankhouser, a senior survey analyst with U.S. Army North, based at Fort Sam Houston, Texas.

Frankhouser said, when needed, the 329th CBRN Company can assist civilian responders at a scene and provide capabilities that may not be available for the civilian incident commander. Like local fire departments and HAZMAT teams, the 329th CBRN Company has the capability to identify and analyze certain toxic chemicals and materials with advanced equipment and can provide that critical support to an incident commander.

Col. Mike Vail, Chief, Homeland Operations Division for the Army Reserve, said the 329th CBRN Company is currently one of two Army Reserve units supporting the Defense CBRN Response Force ("DCRF") for the CBRN Response Enterprise.

The DCRF mission is to save lives, mitigate human suffering and facilitate recovery operations in a CBRN environment. More than 5,200 Soldiers, Sailors, Airmen, Marines and civilians from active-duty and reserve component units make up the scalable force which can respond to local, state, tribal or federal agencies to support efforts in the event of a CBRN incident.

Miami Dade Fire Rescue Department, MDFRD, Hazardous Materials Bureau recently conducted field testing of the Demron Ice suit as a potential Personal Protective Equipment (PPE) garment for certain mission specific tasks.

Miami Dade Fire Rescue Department's Hazardous Materials Bureau at the time had just finished developing an EBOLA response plan in which several chemical protective garments were tested for that threat. One of the garments tested at the time showed to be promising for both Biological and Chemical agents since it provided the same capabilities of a Level A suit.

The final challenge which proved to be the hardest, according to Captain Tony Trim, Hazardous Materials Bureau of MDFRD "was to find an appropriate garment that would be able to handle the abuse of working in a not so friendly environment such as that found in the ship cargo holds, cargo containers, and engine rooms, and still provide the user with the best chemical protection." Working together with the suit manufacture, Radiation Shield Technologies, the garment was upgraded to meet the demands for abrasion protection and heat diffusion. "The Demron ICE CBRN suit is a game changer. The Demron ICE PPE is the only self-cooling suit that can be used in prolonged tactical operations, while providing uncompromised protection against Chemical Biological Radiological and Nuclear Protection," says Ronald DeMeo, MD MBA, the CEO of Radiation Shield Technologies.

Once the suit was developed it was put through rigorous testing during the joint exercise at PortMiami to ensure it would hold up to the demands of a Maritime Response. Both exercises were designed to test the capabilities of MDFRD's potential response to the release of a Hazardous Material release onboard a vessel. During each exercise the Demron ICE suit was worn by six members of the HazMat team for a period of approximately 105 minutes without any interruptions or without any need to break the seal. Average temperatures during both events was approximately 82°+Fahrenheit. Where other PPE suits would not have been suitable or as effective as the ICE suit for these missions, the ICE suit performed well and showed its adaptability and durability as a rugged, yet flexible protective garment.

The suit has now been incorporated into the response plan of MDFRD as the preferred level of protective garment for Maritime Response.

ABOUT RADIATION SHIELD TECHNOLOGIES (RST)
With its headquarters and manufacturing facilities in Miami, Florida, RST is the global leader in the research, development, manufacturing and distribution of high energy anti- chemical, biological, radiological, nuclear and thermally protective garments.. Demron ICE is lighter in weight and used for low to moderate radiation while providing unsurpassed chemical, biological, as well as blood and viral protection (Certified to ASTM F1670 and ASTM F1671 standards). Demron®'s product line is used worldwide by NATO, NASA, every branch of the U.S. military, U.S. CST teams, the FDNY, IAEC, DSTA, Pentagon Force Protection Agency and many international first responders and military teams in Japan, China, Iraq, Kuwait, South Korea, Pakistan, UAE, Saudi Arabia, Vietnam, and Singapore. For more information please visit **www.radshield.com**, or contact us via email **info@radshield.com** or via phone **(866) 7DEMRON.**

DEMRON ICE MULTI USE SUIT

With Patented Self-Cooling Fabric Provides Highest Protection from Viral, Biological, Chemical Threats and Heat Stress

DEMRON CBRN, Blood, and Virus Protection Suit. Developed to exceed ASTM F1670/F1671 Standards for blood and viral (EBOLA and ZIKA) penetration resistance as per CDC guidelines released November 03, 2014.

UNIQUE CAPABILITIES:

Superior Heat Stress Mitigation and Management

Most suits that are worn to protect against **EBOLA** and **ZIKA Virus** exposure hazards trap heat and vapor in the suit creating significant and potentially life threatening heat stress. Demron ICE is thermo conductive, and a passive cooling system. The reduced heat stress translates to extended operational times and maximum comfort for the wearer.

Just as heat release is critical to maintaining an operational core temperature, the ability to proactively combat heat stress is paramount. Demron ICE fabric has metal properties that promote passive cooling and make is possible to cool the wearer by external means. The application of wet towel or ice pack can dramatically heighten the wearer's mental state and physical ability to work longer hours.

REUSABLE/MULTI USE

The Demron ICE material is rugged, durable, and engineered to withstand constant use. Prospective decontamination procedures and agents will not degrade the material during the doffing process. Resistant to tearing, Demron ICE fabric exceeds all CDC tensile strength recommendations.

MULTIPLE MISSION SPECIFIC SUIT CONFIGURATIONS

Standard Full Body Suit with integrated hood.

Certifications

ASTM F1670, ASTM F1671 Blood and Viral Penetration Resistance
ISO 8194 Certified: Radiation Protective Clothing
ISO 9001 Certified: Quality Management
ISO 13485 Medical Devices Quality Management

CUSTOMIZATION OPTIONS:

- Glove System: Ultra Barrier inner glove attached to suit
- Footwear System: Sock-like bootie extensions attached to suit
- Integrated Class 2 hood face seal

RST Radiation Shield Technologies Tel: 866.7DEMRON | Fax: 866.5DEMRON | www.RadShield.com

DEMRON™ ICE

ASTM C177

STEADY–STATE HEAT FLUX MEASUREMENTS AND THERMAL TRANSMISSION PROPERTIES BY MEANS OF THE GUARDED-HOT-PLATE APPARATUS

Significance and Use

This test method covers the measurement of heat flux and associated test conditions for flat specimens. The guarded-hot-plate apparatus is generally used to measure steady-state heat flux through materials having a “low” thermal conductivity and commonly denoted as “thermal insulators.” Acceptable measurement accuracy requires specimen geometry with a large ratio of area to thickness.

Two specimens are selected with their thickness, areas, and densities as identical as possible, and one specimen is placed on each side of the guarded-hot-plate. The faces of the specimens opposite the guarded-hot-plate and primary guard are placed in contact with the surfaces of the cold surface assemblies.

Steady-state heat transmission through thermal insulators is not easily measured, even at room temperature. This is because heat may be transmitted through a specimen by any or all of three separate modes of heat transfer (radiation, conduction, and convection); any inhomogeneity or anisotropy in the specimen may require special experimental precautions to measure that flow of heat; hours or even days may be required to achieve the thermal steady-state; no guarding system can be constructed to force the metered heat to pass only through the test area of insulation specimen being measured; moisture content within the material may cause transient behavior; and physical or chemical change in the material with time or environmental condition may permanently alter the specimen.

Application of this test method on different test insulations requires that the designer make choices in the design selection of materials of construction and measurement and control systems. Thus there may be different designs for the guarded-hot-plate apparatus when used at ambient versus cryogenic or high temperatures. Test thickness, temperature range, temperature difference range, ambient conditions and other system parameters must also be selected during the design phase. Annex A1 is referenced to the user, which addresses such issues as limitations of the apparatus, thickness measurement considerations and measurement uncertainties, all of which must be considered in the design and operation of the apparatus.

Apparatus constructed and operated in accordance with this test method should be capable of accurate measurements for its design range of application. Since this test method is applicable to a wide range of specimen characteristics, test conditions, and apparatus design, it is impractical to give an all-inclusive statement of precision and bias for the test method. Analysis of the specific apparatus used is required to specify a precision and bias for the reported results. For this reason, conformance with the test method requires that the user must estimate and report the uncertainty of the results under the reported test conditions.

Qualification of a new apparatus: When a new or modified design is developed, tests shall be conducted on at least two materials of known thermal stability and having verified or calibrated properties traceable to a national standards laboratory. Tests shall be conducted for at least two sets of temperature conditions that cover the operating range for the apparatus. If the differences between the test results and the national standards laboratory characterization are determined to be significant, then the source of the error shall, if possible, be identified. Only after successful comparison with the certified samples, can the apparatus claim conformance with this test method. It is recommended that checks be continued on a periodic basis to confirm continued conformance of the apparatus.

The thermal transmission properties of a specimen of material: may vary due to the composition of the material; may be affected by moisture or other environmental conditions; may change with time or temperature exposure; may change with thickness; may change with temperature difference across the specimen; or may change with mean temperature. It must be recognized, therefore, that the selection of a representative value of thermal transmission properties for a material must be based upon a consideration of these factors and an adequate amount of test information.

Since both heat flux and its uncertainty may be dependent upon environmental and apparatus test conditions, as well as intrinsic characteristics of the specimen, the report for this test method shall include a thorough description of the specimen and of the test conditions.

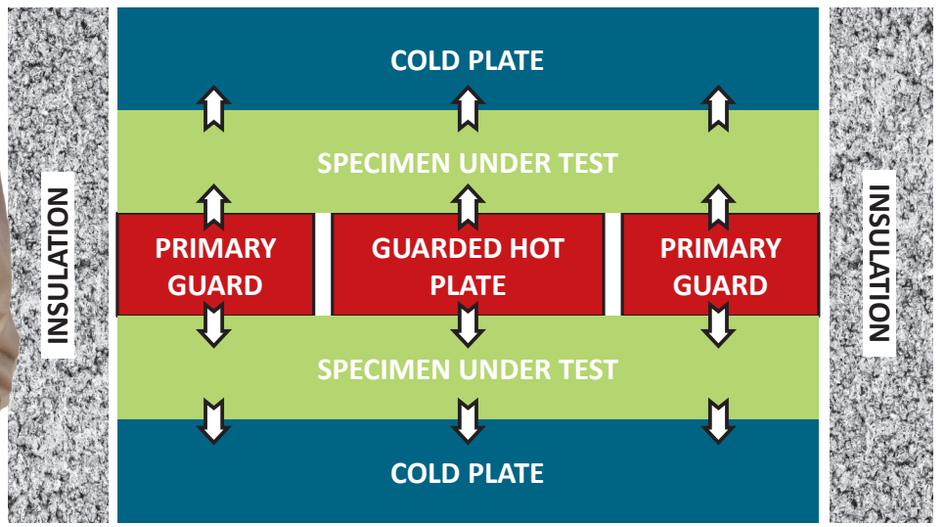
The results of comparative test methods such as Test Method C518 depend on the quality of the heat flux reference standards. The apparatus in this test method is one of the absolute methods used for generation of the reference standards. The accuracy of any comparative method can be no better than that of the referenced procedure. While the precision of a comparative method such as Test Method C518 may be comparable with that of this test method, Test Method C518 cannot be more accurate. In cases of dispute, this test method is the recommended procedure.

1. Scope

1.1 This test method establishes the criteria for the laboratory measurement of the steady-state heat flux through flat, homogeneous specimen(s) when their surfaces are in contact with solid, parallel boundaries held at constant temperatures using the guarded-hot-plate apparatus.

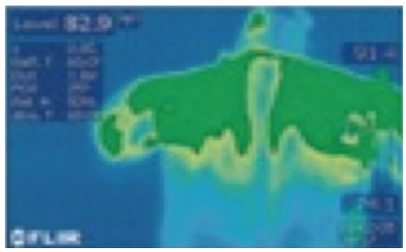
1.2 The test apparatus designed for this purpose is known as a guarded-hot-plate apparatus and is a primary (or absolute) method. This test method is comparable, but not identical, to ISO 8302.

IDEALIZED HEAT FLOW IN A BIDIRECTIONAL GUARDED HOT PLATE APPARATUS



Two identical specimens are needed for one test.

Heat Flow Direction Indicators



FLIR thermal imaging camera shows heat being transferred to the thermally conductive Demron ICE suit and being released into the atmosphere. Complete video may be viewed at: www.youtube.com/watch?v=WzUEx87lZnM

PROTECTIVE CLOTHING LABORATORY DATA SHEET
NFPA 1994 - Protective Ensembles for First Resonders to CBRN
Section 8.7 - Chemical Permeation Resistance Testing

Client:	**Radiation Shield Technologies, Inc.**	**Log Number(s):**	**CRT 1507161034**
Product Description:	**Red Demron ICE lot**		
Job Number:	**G102180184**	**SEI Reference Number:**	**500608000**
Reference:	**NFPA 1994 - section 8.7**		
Conditioning:	**In accordance with NFPA 1994 - section 8.7.3.7, Samples shall be conditioned at a temperature of 32°C (±1°C) and a relative humidity of 80% (±5%) for at least 24 hours.**		

Conditioning Start: 7/21/2015 **Conditioning Stop:** 7/30/2015
Conditioning Temp Range (°C): 32±1 **Conditioning RH Range (%):** 80±5
Condition Location: Chem chamber #1

Sample Area*: 9.93 cm^2 **Collection Medium*:** 10 ml DI water
Average Cumulative Perm. Limit*: 6.0 µg/cm^2 **Minimum Detectable Rate*:** 0.1 µg/cm^2
Challenge Contact*: Continuous

* applies to all test, samples and chemicals

Challenge Chemical: Dimethyl sulfate (10g/m²) CAS #: 77-78-1
Source / Product # : Sigma Aldrich
Challenge Length : 60 minutes Sampling Frequency: Once

Test Results	Cell 1	Cell 2	Cell 3	AVG	Std Dev
Cumulative Permeation Mass (µg/cm^2)	3.42	1.76	3.34	2.84	0.94
Ave. Sample Thickness (mils)	23	24	24	24	1
Ave. Sample Thickness (mm)	0.58	0.61	0.61	0.60	0.01

Challenge Chemical: Chlorine (350 ppm) CAS #: 7782-50-5
Source / Product # : AirGas
Challenge Length : 60 minutes Sampling Frequency: Once

Test Results	Cell 1	Cell 2	Cell 3	AVG	Std Dev
Cumulative Permeation Mass (µg/cm^2)	0.28	2.65	1.78	1.57	1.20
Ave. Sample Thickness (mils)	23	23	24	23	1
Ave. Sample Thickness (mm)	0.58	0.58	0.61	0.59	0.01

Challenge Chemical: Ammonia (350 ppm) CAS #: 7664-41-7
Source / Product # : AirGas
Challenge Length : 60 minutes Sampling Frequency: Once

Test Results	Cell 1	Cell 2	Cell 3	AVG	Std Dev
Cumulative Permeation Mass (µg/cm^2)	0.16	0.19	0.19	0.18	0.02
Ave. Sample Thickness (mils)	23	23	23	23	0
Ave. Sample Thickness (mm)	0.58	0.58	0.61	0.59	0.01

Challenge Chemical: Acrolein (350 ppm) CAS #: 107-02-8
Source / Product # : AirGas
Challenge Length : 60 minutes Sampling Frequency: Once

Test Results	Cell 1	Cell 2	Cell 3	AVG	Std Dev
Cumulative Permeation Mass (µg/cm^2)	<0.1	<0.1	<0.1	0.10	0.00
Ave. Sample Thickness (mils)	23	24	24	24	1
Ave. Sample Thickness (mm)	0.58	0.61	0.61	0.60	0.01

Challenge Chemical: Acrylonitrile (350 ppm) CAS #: 107-13-1
Source / Product # : AirGas
Challenge Length : 60 minutes Sampling Frequency: Once

Test Results	Cell 1	Cell 2	Cell 3	AVG	Std Dev
Cumulative Permeation Mass (µg/cm^2)	0.36	0.36	0.36	0.36	0.00
Ave. Sample Thickness (mils)	23	24	23	23	1
Ave. Sample Thickness (mm)	0.58	0.61	0.58	0.59	0.01

Time of Test: 23:00 **Test Location:** Chemistry Lab **Test Temp.:** 32±1°C **RH:** 80%

Equipment Used	Control Number	Calibration Date	Calibration Due
Thickness	**N1244**	**1/8/2015**	**1/8/2016**
Conductivity meter	**C203**	**11/13/2014**	**11/13/2015**

Test Date: 7/30/2015 **Chemist** Adam Stringer
GC Date: 7/31/2015 **Type name:** Adam Stringer

PROTECTIVE CLOTHING LABORATORY DATA SHEET
SECTION 7.1.2.7
VIRAL PENETRATION RESISTANCE TEST
ASTM F1671-07 Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Blood-Borne Pathogens Using Phi-X174 Bacteriophage Penetration as a Test System

Client:	**Radiation Shield Technologies, Inc.**	**Sample Log Number(s):**	**CRT1507161034-001**
PRODUCT DESCRIPTION: Red Demron Ice- Lot # RSC-01-150615-35-48			
Job Number:	**G102180184**	**Quote Number:**	**500608000**
Reference:	NFPA 1994 (2012 Edition), Section 7.1.2.7 & Section 8.21; ASTM F1671.		
PRE-CONDITIONING: In Accordance with Section 8.1.3 and Section 8.1.4			
CONDITIONING: In Accordance with Section 8.1.2 In accordance with NFPA 1994; section 8.1.2, at a temperature 21°C ± 3°C (70°F ± 5°F) and a relative humidity of 65% ± 5% until equilibrium is reached or for at least 24 hours, whichever is shorter.			

Quality Control Samples	PFU/ml	Results
Positive Control	>150	Acceptable (valid test)
Negative Control	0	Acceptable (valid test)
Pre-test Bacteriophage Titer	1.1×10^8	Acceptable (valid test)
Post Test Bacteriophage Titer	1.1×10^8	Acceptable (valid test)
Settle Plate(s)	0	Acceptable (valid test)

Testing Procedure Used:	Procedure A: 0 psig for 5 minutes, 2 psig for 1 minute, 0 psig for 54 minutes. No retaining screen used.

Test Results	Cell 1		Cell 2		Cell 3	
	Plate 1	Plate 2	Plate 1	Plate 2	Plate 1	Plate 2
Number of Plaques	0	0	0	0	0	0
Assay Volume (ml)	5		5		5	
Assay Titer (pfu/ml)	0		0		0	
Sample Thickness (mils)	23		23		23	
Sample Weight (g)	2.2613		2.2186		2.3185	
Test Terminated due to Liquid Penetration	No		No		No	
Pass/Fail	Pass		Pass		Pass	

Equipment Used	Asset Number	Calibration Date	Calibration Due
Thickness	N1244	1/8/2015	1/8/2016
Weight	S940	4/8/2015	4/8/2016
Pressure	P1058	4/23/2015	4/23/2016

Analytical Notes:

Test Date: 7/29/2015 **Technician Name:** Kimberly Lea

Technician Signature:

SECTION 7.1.2.1
WARFARE AGENT CHEMICAL PERMEATION RESISTANCE
(TEST CONDUCTED AT AVARINT, LOCATED IN BUFFALO, NY)

Avarint
A CUBIC Company

NFPA TEST REPORT

Method: NFPA 1994; Class 1 (2018 ed)
Material ID: Radiation Shield Tech G103707701 CRT1902011100-001
Material Type: Demron Ice Material
Test Date: 2/8/2019
Report Date: 2/11/2019

Customer: Intertek
3933 US Route 1
Cortland, NY 13045

Test Trial Summary Information

Test Trial: A0026-99
Test Duration: 60 minutes
Temperature: 90.3°F
Pass Criteria: < 0.43 µg/cm² (15 min); 1.25 µg/cm² (60 min)
Chemical: GD
DCR Response: 107%
Relative Humidity: 78.5%
Detection Limit: 0.05 µg/cm²

Test Results

Demron Ice Material

Avarint Sample Control Number	Sample Type	Permeation (µg/cm²) t = 15 min	Permeation (µg/cm²) t = 60 min
A0026-2081	Replicate 1	ND	0.16
A0026-2082	Replicate 2	ND	0.13
A0026-2083	Replicate 3	ND	0.18
A0026-2084	Neg. Ctrl	ND	ND
Pos. Ctrl	Average recovery (%)	58%	ND

Avarint Sample Control Number	Sample Type	Permeation (µg/cm²) t = 15 min	Permeation (µg/cm²) t = 60 min

Avarint Sample Control Number	Sample Type	Permeation (µg/cm²) t = 15 min	Permeation (µg/cm²) t = 60 min

Avarint Sample Control Number	Sample Type	Permeation (µg/cm²) t = 15 min	Permeation (µg/cm²) t = 60 min

Avarint Sample Control Number	Sample Type	Permeation (µg/cm²) t = 15 min	Permeation (µg/cm²) t = 60 min

Avarint Sample Control Number	Sample Type	Permeation (µg/cm²) t = 15 min	Permeation (µg/cm²) t = 60 min

Permeation results that are below the detection limit are reported as non-detect (ND).

Prepared by:
Scott C. Glogowski
Research Scientist

Approved by:
Rich Fitzpatrick
Director, Chemical Sciences Group

RST Radiation Shield Technologies

FOR MORE INFORMATION CONTACT:
Radiation Shield Technologies
PO Box 14-4254, Coral Gables, FL 33114
Tel: 866.7DEMRON Fax: 866.5DEMRON
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HEAT STRESS · CHEMICAL TOXINS · BIOLOGICAL HAZARDS · NUCLEAR RADIATION

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