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CNRO-2006-00021

May 16, 2006

U. S. Nuclear Regulatory Commission
Attn.: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Request for Use of Delta Protection Mururoa V4F1 R Supplied Air Suits

Arkansas Nuclear One
Units 1 & 2
Docket Nos. 50-313 & 50-368
License Nos. DPR-51 and NPF-6

Indian Point Nuclear Generating
Units Nos. 1, 2 and 3 Docket Nos.
50-003, 50-247, and 50-286
License Nos.
DPR-5, DPR-26, and DPR-64

Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. NPF-29

Waterford Steam Electric Station,
Unit 3
Docket No. 50-382
License No. NPF-38

James A. FitzPatrick Nuclear Power
Plant Docket No. 50-333
License No. DPR-59

River Bend Station
Docket No. 50-458
License No. NPF-47

Pilgrim Nuclear Power Station
Docket No. 50-293
License No. DPR-35

Vermont Yankee Nuclear Power
Docket No. 50-271
License No. DPR-28

Dear Sir or Madam:

Entergy Operations Inc. and Entergy Nuclear Operations Inc. (Entergy) have identified the Delta Protection suits as having benefits from a contamination control, heat stress reduction, and respiratory protection point of view. These suits are not approved for use as a respirator in the United States by the National Institute for Occupational Safety and Health (NIOSH). Pursuant to 10 CFR 20.1703(b), Entergy requests authorization for use of equipment that has not been tested or certified by NIOSH. Pursuant to 10 CFR 20.1705, Entergy also requests assignment of a protection factor of 5000, which exceeds those specified in Appendix A of 10 CFR 20.

A001

Attachment 1 provides the documentation supporting the request. As described in the enclosure, approval of the request would improve worker safety in areas of airborne radioactivity and high potential for facial/skin contamination from hot particles. Entergy South has already received approvals for the use of the V4 MTH 2 suit. However, breathable network limitations have revealed that the Mururoa V4F1 R suit would better meet with the breathable networks capabilities. The V4F1 R suits have the capability of handling incoming pressures via a self adjusting regulator on the suit. The suit accepts variable pressure from 35-100 psig (2.5 Bar to 7 Bar). In addition, the suit has a self regulating feature that controls air flow within the above pressure range. No manual intervention is required.

Entergy has summarized new commitments related to this request in Attachment 2.

Approval of the suits use will allow Entergy to proceed with procedure changes and complete training necessary for the use of the suits for outages scheduled for the fall of 2006. Therefore, Entergy is requesting approval by August 1, 2006.

Should you have any questions regarding this submittal, please contact Bill Brice at (601) 368-5076.

Very truly yours,



FGB/WBB/bal

Attachments:

1. Approval Request for Delta Protection Mururoa V4F1 R Encapsulating Suits
 - Enclosure 5.1 to Attachment 1, General Description of the Delta Protection Supplied Air Suit
 - Enclosure 5.2 to Attachment 1, European Standard EN 1073-1; 1998 for Ventilated Protective Clothing
 - Enclosure 5.3 to Attachment 1, Certificate No. 0073/197/162/02/01/0005 for Mururoa V4F1 R
 - Enclosure 5.4 to Attachment 1, Donning and Removal Instructions for Mururoa V4F1 R
2. List of Regulatory Commitments

cc: (see next page)

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ATTACHMENT 1

CNRO-2006-00021

**APPROVAL REQUEST FOR DELTA PROTECTION MURUROA V4F1 R
ENCAPSULATING SUITS**

**APPROVAL REQUEST FOR DELTA PROTECTION MURUROA V4F1 R
ENCAPSULATING SUITS**

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1.0 INTRODUCTION

1.1 PURPOSE

10 CFR 20, Appendix A, "Assigned Protection Factors for Respirators," states that an air-supplied suit may be used in a continuous-flow mode, however, an Assigned Protection Factor (APF) has not been designated. A footnote to this equipment application indicates that the suit can be used in a respiratory protection program if the minimum program requirements are met (e.g., 10 CFR 20.1703, "Use of Individual Respiratory Protection Equipment"). 10 CFR 20.1703 states that use of non-National Institute for Occupational Safety and Health (NIOSH) equipment is acceptable only if approved for use by the Nuclear Regulatory Commission (NRC). Since 10 CFR 20, Appendix A does not specify an APF for these air-supplied suits, 10 CFR 20.1705, "Application for Use of Higher Assigned Protection Factors," would have to be exercised in order to obtain NRC approval for exceeding the requirements of 10 CFR 20, Appendix A.

The Mururoa suits were accepted by the NRC in September 14, 2005 for use by Callaway as a respiratory device with a protection factor of 5000 (TAC NO. MC7242). Additionally, on April 8, 2005 the NRC approved the use a respiratory device with a protection factor of 5000 for St. Lucie, Turkey Point and Seabrook. The V4 MTH2 suits have also been approved for use at Entergy South plants with a protection factor of 2000. The Mururoa suits have been widely used in western European nuclear power plants (the manufacturer indicates that approximately 60,000 Mururoa garments/suits are used by these plants each year) as well as many plants already in North America.

1.2 BACKGROUND

1.2.1 Regulatory Requirements

Entergy Operations Inc. and Entergy Nuclear Operations Inc. (Entergy) propose the use of the Mururoa "fully enclosed suit" model V4F1 R manufactured by Delta Protection, France. The purpose of this submittal is to request approval for the use of these particular suits and for authorization to use an APF of 5000 when using the suits. Additionally, due to the advanced safety features for emergency breathing and emergency escape built into these suit models, Entergy may choose to use the Mururoa suits without dedicated rescue personnel being assigned. In addition, this particular suit deals with variable pressures which are created by our breathable air network. The suit can handle pressures from 35 – 100 PSIG (2.5 Bar to 7 Bar) at the suit inlet. In addition, the suit has a self regulating air flow valve which eliminates manual intervention.

The following regulatory requirements are relevant to this request.

10 CFR 20.1703, "Use of Individual Respiratory Protection Equipment," requires that if a licensee assigns or permits the use of respiratory protection equipment to limit the intake of radioactive material, (a) the licensee shall use only respiratory protection equipment that is tested and certified by NIOSH.

10 CFR 20.1703(b) allows that if the licensee wishes to use equipment that has not been tested or certified by NIOSH, or for which there is no schedule for testing or certification, the licensee shall submit an application to the NRC to authorize use of the equipment.

10 CFR 20.1705, "Application for Use of Higher Assigned Protection Factors," requires that a licensee shall obtain authorization from the NRC before using assigned protection factors in excess of those specified in 10 CFR 20, Appendix A.

10 CFR 20, Appendix A, "Assigned Protection Factors for Respirators," Item II, "Atmosphere Supplying Respirators (particulate, gases and vapors)," indicates that for a suit in a continuous flow operating mode, no APF is assigned nor is a NIOSH approval schedule currently available for the evaluation of such suits. Such equipment may be used in an acceptable respiratory protection program as long as all the other minimum program requirements, with the exception of fit testing, are met (i.e., 10 CFR 20.1703).

Based on these regulatory requirements, Entergy is required to obtain NRC approval for both the use of and the assigned protection factor for the Mururoa model V4F1 R suit.

1.2.2 Suit Construction

The Mururoa Model V4F1 R suit meets ISO 8194 and the European Standard EN 1073-1:1998. The manufacturer, Delta Protection, is ISO 9000 certified.

The Mururoa single use suits have the following desirable features that are not available in the "bubble hoods" and "rain suits" manufactured in the United States:

- 1) One piece single use suit that includes welded gloves and booties with tie straps,
- 2) Made of flexible PVC with reinforced elbows, knees and crotch areas,
- 3) Dual zippers - metal zipper inside and plastic zipper outside,
- 4) Helmet made of clear Poly Vinyl Chloride (PVC) material that provides distortion-free vision and large enough for wearing a headset,
- 5) Welded sleeve to insert communication cable,
- 6) A removable strip near the mouth that could be used for emergency breathing in case of loss of supplied air,
- 7) An egress strip stretching from left arm, over the head, to right arm that is used for undressing and for self-rescue in an emergency, such as loss of supplied air,
- 8) Air intake located at the waist with a built-in regulator that self adjusts airflow,
- 9) Two exhaust valves that provide ventilation, and also protect from overpressure,
- 10) Very low noise level (<80 db) at maximum air flow, and
- 11) Air flow to the arms, legs, and face.

Air hoses of any length can be used, but air shall be supplied to the Mururoa suits between 35-100 psig (2.5 Bar to 7 Bar) measured at the inlet. A regulator at the inlet automatically adjusts the airflow from 16-26 CFM (450 litres/min. to 750 litres/min). To ensure user safety, the regulator cannot shut off the air supply. There are two exhaust vents on the back - one behind the neck and one at lower back. The exhaust vents have patented magnetic seals to prevent any aspiration of contaminants if supplied air is lost. The Mururoa is approved for use with different fittings in Europe and can be fitted with Schrader or Foster or CEJN type fittings used at the Entergy facilities.

The Mururoa Model V4F1 R suit is made of flexible PVC material. Examination of the suit shows there are two air vents near the chin for cooling the face, as well as a distribution network for air to go to the arms and the legs.

1.2.3 Safety Features of the Mururoa Model V4F1 R Suit

All Mururoa suit models are lightweight (2.5 lbs), made of fire-retardant material and can be used in temperatures up to 140° F., as per European Standard EN 1073-1. The suits have built-in gloves, booties with binding ties, and have reinforced elbows, knees and crotch. A transparent helmet with 6 inch X 8-inch clear faceplate provides distortion-free view. Dual magnetic ventilation valves provide needed ventilation and relief of excess pressure in case suit is squeezed/pinched unexpectedly. In case of loss of air, the user can remove the mouth strip and move the opening close to his face, or enlarge the opening, to breathe outside air. Alternatively, the user can pull the escape strip from either forearm, over the head and towards the other forearm, and rip the suit in two halves. This escape strip is normally used for egress from the suit when the work activity has been completed.

The Mururoa suit's design does not permit its use in an Immediately Dangerous to Life and Health (IDLH) atmosphere. Entergy plans to use this suit for protection against radioactive particulate contamination only. The Mururoa suit is also not designed for use with any personal cooling units such as a Vortex tube, but can be used with a cooling vest supplied by the manufacturer, if desired.

1.2.4 Implementation

Entergy sites have respiratory programs in full compliance with 10 CFR 20. The Mururoa V4F1 R suits will be integrated into the Entergy respiratory program using the information provided by the manufacturer. New lesson plans will be developed to train workers on the Mururoa's features, donning, use and removal of the suits, cautions and use of mouth strip and tear off strips for routine and emergency egress. Radiation Protection personnel will be provided additional training for the Mururoa suit including selection, approval, issue, equipment set-up, operation, and maintenance instructions. The Mururoa suit's safety features, namely the tear-off mouth strip and the emergency tear-off strip, make it unnecessary for any standby rescue personnel. Additionally, in many cases, workers are in direct contact with Radiation Protection or support personnel via audio headsets. The ability to eliminate the rescue worker is an ALARA consideration since the work areas where air-supplied suits are used are typically areas with higher radiation and contamination levels. Steam generator platform work, reactor cavity decontamination, and equipment decontamination are specifically targeted for the use of the Mururoa suit.

Entergy will use the Corrective Action Program (CAP) to document and evaluate any unexpected problems with the suits. The manufacturer is subjected to checks from the IPSN (Institute for Nuclear Protection and Security) to insure the product has no risk of injury to the user. A second organization called ASQUAL (an advisory group to regulators) performs annual inspections of the factory to certify that the manufactured product is of the same quality approved by the IPSN. Several destructive/non-destructive tests are performed by the manufacturer for each order received from clients. Any defects reported by clients, investigations, and corrective actions are documented by Delta Protection. Customers are notified of significant problems and products are recalled if necessary. This information is made available to ASQUAL for their annual inspections. All suits and cartridges will be

treated as "Single Use" only. The suit system will not be used in an IDLH environment. Entergy will report any defects in a timely manner to the U.S. Nuclear Industry through our operating experience process.

Entergy currently uses air supplied hoods, (commonly known as the bubble hood) for jobs involving overhead contaminated water or high potential for skin contamination from discrete radioactive particles, and to prevent intake of airborne contaminants. Because the bubble hoods do not cover the hands and the feet, workers have to wear additional protective clothing, including two pairs of gloves, rubber shoes and booties and tape for sealing. Chances of cross contamination during undressing/exit from the contaminated areas are high. The Mururoa suits offer a better alternative (with their unitized construction and ease of removal) and should protect the worker much better against facial/skin contamination and airborne radioactivity. Approval of a protection factor of 5000 for the Mururoa suits would allow use of the Mururoa suits in Entergy's efforts to control contamination incidents and prevent intakes during operational activities at all of the Entergy's facilities.

2.0 TECHNICAL JUSTIFICATION

2.1 EVALUATION

Entergy reviewed the following documents obtained from Delta Protection:

- General Description of the Mururoa Model V4F1 R Ventilated Suits (Enclosure 5.1),
- European Standard EN 1073-1:1998 for Ventilated Protective Clothing (Enclosure 5.2),
- Certificate No. 0073/197/162/02/01/0005 for Mururoa Model V4F1 R Issued by the Institute for Nuclear Protection and Security (Enclosure 5.3),
- Donning and Removal Instructions for Mururoa V4F1 R (Enclosure 5.4).

Based on a review of this documentation, the suits represent a better design than the currently approved "bubble hood" and "rain suit" combination and provide better worker protection with the data supporting an APF of at least 5000.

A key element of this review was the application of the European Standard and the Certificate issued by the Institute for Nuclear Protection and Security for the Mururoa suits. The European Standard (Enclosure 5.2) requires that the suit material be tested for resistance to abrasion, flex cracking, puncture, blocking, tear and flammability, strength of seams, joints and assemblies, damage resistance of exhaust valves, designed flow rates for pressure range of supplied air, noise level, and quality of the visor. According to the testing standard, three workers should perform standard exercises, each wearing two different suits inside a chamber filled with a test agent (Sodium Chloride) and measure the leakages during the exercise regimen lasting 20 minutes. Operating parameters are set to manufacturer's instructions. Standard exercises include walking on a treadmill at 2 mph (3 minutes), moving arms up and down above head while looking upward (3 minutes) and squatting continuously (3 minutes). To ensure worker's comfort, two additional practical exercises - walking at 2 mph (5 minutes) and loading a bucket with wood chips from the base of a hopper and emptying it into the opening on top (15 minutes) - should be performed by two workers at specified air

flow rates. Certificate No. 0073/197/162/02/01/0005 (Enclosure 5.3) states that the Mururoa Model V4F1 R passed in all categories tested and provided a protection factor greater than 50,000. It should be noted that the term 'protection factor' used in the European Standard is equivalent to the 'fit factor' used in the United States and is not the same as the Assigned Protection Factor used in 10 CFR 20.

Entergy also conducted an in-house inspection and demonstration of the suits. This inspection/demonstration indicated that the Mururoa suits are an improvement over the currently used suits due to their ease in donning and removal.

The NRC approved the use of the Mururoa Model V4 MTH2 suit with an APF of 2000 for the Duke Energy Corporation in June 2003 (TAC NOS. MB 7952, MB7953, MB7954, MB7955, MB7956, MB7957, and MB7958) and Entergy plants on February 1, 2005 (TAC NOS. MC5363, MC5364, MC5365, MC5366, MC5367). The Mururoa suits were accepted by the NRC in September 14, 2005 for use by Callaway as a respiratory device with a protection factor of 5000 (TAC NO. MC7242). Additionally, on April 8, 2005 the NRC approved the use of the suits with a protection factor of 5000 for St. Lucie, Turkey Point and Seabrook.

3.0 CONCLUSION

Entergy requests the approval for the use of the suits as per 10 CFR 20.1703(a), which requires use of respiratory protection equipment that is tested and certified by NIOSH or alternatively which is approved for use by the NRC. Based on in-house inspection of suits and review of industry and manufacturer test documentation, Entergy has determined that the Mururoa V4F1 R model air supplied suits offer a safer and more efficient means to protect workers in areas of either high radiological contamination and/or high potential for airborne contamination. The existing rain suits and bubble hoods provide cooling only to the head and force workers to wear the ensemble in a manner that makes self-rescue nearly impossible, thus requiring a rescue worker to be stationed nearby. Ease of removal of the Mururoa suit provides for more desirable self-rescue features. Additionally, the Mururoa suits provide a means to undress that minimizes the potential for personnel contamination events. Furthermore, the suit has been designed to handle variable pressures at the inlet thus giving us more flexibility of operations during our outage.

4.0 REFERENCES

1. 10 CFR 20.1703, "Use of Individual Respiratory Protection Equipment"
2. 10 CFR 20.1705, "Application for Use of Higher Assigned Protection Factors"
3. 10 CFR 20, Appendix A, "Assigned Protection Factors for Respirators"
4. Regulatory Guide 8.15 (Revision 1), "Acceptable Programs for Respiratory Protection"
5. NUREG-0041, "Manual of Respiratory Protection Against Airborne Radioactive Materials"
6. European Standard EN 1073-1:1998 (see enclosure 5.2)
7. EC Type Examination Certificate No. 0073/197/162/02/01/0005 for the V4F1 R suit dated February 21, 2001 (see enclosure 5.4)

Enclosure 5.1 to Attachment 1

CNRO-2006-00021

General Description of the Delta Protection Supplied Air Suit

DATA SHEET



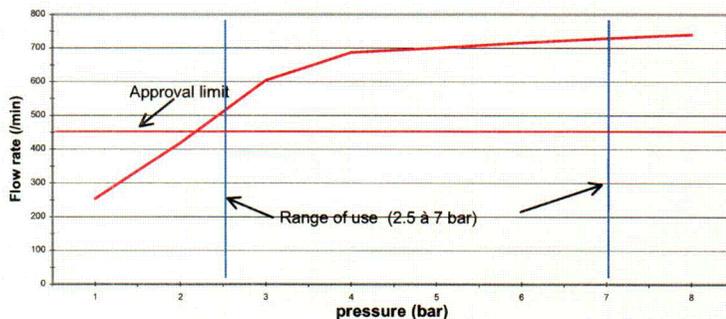
MURUROA V4 F1 R

REF : 848 1X5T

DESCRIPTION

Garment approved for protection against radioactive contamination, ventilated, pressurised, single-use type.
Intended for use with a breathable air network in nuclear enclosures.
Suit equipped with a supplied air regulation system providing a constant flow rate, on a network supplying a relative pressure between 2.5 and 7 bar inclusive.

Flow rate Deltaflow® V4F1R pressure regulator



This type of sealed suit features dual back closure, an internal distribution system, anti-skid feet, a doffing strip, a safety strip, Deltaflow flow regulator, various reinforcements, a loop for the supply line and a back sleeve for a safety lanyard.

The exhaust is via two patented magnetic valves.

The garment is flame retardant, and is made mainly from PVC 20/100. Assembled by High Frequency welding, which does not affect the qualities of the PVC.

SUPPLEMENTARY INFORMATIONS

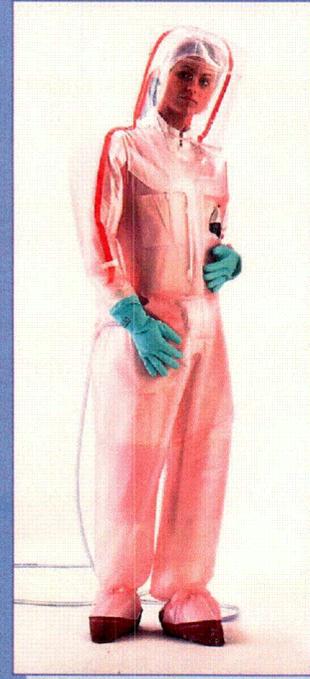
The suit is certified for a breathable air supply at a pressure of between 2.5 and 7 bar inclusive; the supply rate will therefore be between:

- Minimum rate: 450 l/min.
- Maximum rate: 750 l/min.

Before any job, the user must ensure he/she has the necessary devices allowing him/her to **check that the minimum air supply foreseen by the manufacturer is reached or exceeded before and during the use of the equipment.**

Accessories:

Translucent visor allowing the user to read a dosimeter.
May be fitted with an aluminised carbon kevlar hood and a protective screen with an electronic filter for welding jobs.
Packaging: 10 suits per carton and per size.
Sizes available: Size 1 to T 5 (Small M L XL XXL)



TECHNICAL SPECIFICATIONS AND STANDARDS

- EC approved overall.
- EC type certificate
0073 / 197 / 162 / 02 / 01 / 0005 du
21/02/2001.
- Satisfies the essential requirements
of: EN 1073-1 (03/1998), EN 340
(12/1993).
- fire classification: M 1 under NFP 92
507.
- Protection factor > 50 000, PPE
class 5 under EN 1073-1.

DELTA PROTECTION
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8481X5T ang-ind a



Enclosure 5.2 to Attachment 1

CNRO-2006-00021

European Standard EN 1073-1; 1998 for Ventilated Protective Clothing

ICS 13.280; 13.340.10

Descriptors: Personal protective equipment, clothing, radioactive contamination.

English version

**Protective clothing against radioactive contamination
Part 1: Requirements and test methods for ventilated protective
clothing against particulate radioactive contamination**

Vêtements de protection contre la
contamination radioactive - Partie 1:
Exigences et méthodes d'essai des
vêtements contre la contamination
radioactive sous forme de particules

Schutzkleidung gegen radioaktive
Kontamination - Teil 1: Anforderungen
und Prüfverfahren für belüftete
Schutzkleidung gegen radioaktive
Kontamination durch feste Partikel

This European Standard was approved by CEN on 1997-11-23. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

The European Standards exist in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

CEN

European Committee for Standardization

Comite Europeen de Normalisation

Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 162 "Protective clothing including hand and arm protection and lifejackets", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 1998, and conflicting national standards shall be withdrawn at the latest by July 1998.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see Informative Annex ZA, which is an integral part of this standard.

The annex A is normative and contains the activity sequence for the testing of the protection factor.

Further parts of this standard will deal with requirements and test methods for unventilated protective clothing and protection against liquids and gases.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the requirements and test methods for ventilated protective clothing protecting the wearer against particulate radioactive contamination.

This European Standard does not apply for the protection against ionizing radiation and the protection of patients against contamination with radioactive substances by diagnostic and/or therapeutic measures.

2 Normative references

This European standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 146

Respiratory protective devices - Powered filtering devices incorporating helmets or hoods - Requirements, testing, marking

EN 270

Respiratory protective devices - Compressed air line breathing apparatus incorporating a hood - Requirements, testing, marking

EN 340

Protective clothing - General requirements

EN 530

Abrasion resistance of protective clothing material - Test methods

EN 863

Protective clothing - Mechanical properties - Test method: Puncture resistance

prEN 943-1

Protective clothing for use against liquid and gaseous chemicals, including liquid aerosols and solid particles - Performance requirements for ventilated and non-ventilated "gas-tight" (Type 1) and "non-gas-tight" (Type 2) protective clothing

EN 1146

Respiratory protective devices for self-rescue - Self-contained open-circuit compressed air breathing apparatus incorporating a hood (compressed air escape apparatus with hood) - Requirements, testing, marking

EN 25978

Rubber- or plastics- coated fabrics - Determination of blocking resistance (ISO 5978 : 1990)

EN 29073-4

Textiles - Test methods for nonwovens - Part 4: Determination of tear resistance

ISO 5082 : 1982

Textiles - woven fabrics - Determination of breaking strength - Grab method

ISO 7854

Rubber- or plastics-coated fabrics - Determination of resistance to damage by flexing

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1 Protective clothing against radioactive contamination

Protective clothing intended to provide protection to the skin and if required to the respiratory tract against radioactive contamination.

3.2 Ventilated protective clothing (against particulate radioactive contamination)

Protective clothing which is supplied with breathable air ensuring internal ventilation and overpressure. This protective clothing provides protection against particulate radioactive contamination for the respiratory tract and the whole body.

3.3 Nominal protection factor (100: inward leakage (IL))

The ratio of the concentration of contaminant in the ambient atmosphere to the concentration of the contaminant in the suit. The concentrations taken into account are the average concentrations recorded during a standardized test.

3.4 Particulate radioactive contamination

Presence of radioactive substances in or on a material or in a place where they are undesirable or could be harmful.

3.5 Seam

A permanent fastening between two or more pieces of protective clothing material.

3.6 Assemblage

A permanent fastening between two or more different garments, or between protective clothing and accessories, obtained, for example by sewing, welding, vulcanising, gluing.

3.7 Join

A non-permanent fastening between two different garments, or between protective clothing and accessories.

3.8 Closure

A device, for example, zipper, "touch and close" fastener, etc., to close openings for donning or removing the protective clothing.

4 Requirements

4.1 Design

4.1.1 Protective clothing against radioactive contamination shall comply with the general requirements specified in EN 340.

4.1.2 The design of the protective clothing shall be such that the protective clothing is straightforward to put on and take off, and to minimize the risk of contamination. Testing according to "practical performance test" (see 5.2).

4.1.3 The clothing can be designed for single or multiple use.

4.1.4 The ventilated protective clothing (see 3.2) may consist of one or several parts. The clothing may be fitted with a respiratory protective device to enable the wearer to breathe in case of failure of the primary air supply.

4.2 Materials

The materials used for protective clothing against particulate radioactive contamination shall meet the requirements according to table 1 after the pretreatment in accordance with 5.1.1 and after the conditioning according to 5.1.2.

Table 1: Requirements for the materials

Requirement	Classification	Test according to	Applicable for	
			reusable materials	single use materials
Abrasion resistance	6 > 2000 Cycles 5 > 1 500 Cycles 4 > 1000 Cycles 3 > 500 Cycles 2 > 100 Cycles 1 > 10 Cycles	EN 530, Method 2 00 abrasive paper according to prEN 943- 1 and 9 kPa downward pressure	yes	yes
Flex cracking resistance	6 > 100000 Cycles 5 > 40000 Cycles 4 > 1 5000 Cycles 3 > 5000 Cycles 2 > 2500 Cycles 1 > 1000 Cycles	ISO 7854 Method B	yes	no
Puncture resistance	3 > 100 N 2 > 50 N 1 > 10 N	EN 863	yes	yes
Resistance to blocking (see note 1)	2 no blocking 1 blocking	EN 25978	yes	no
Tear resistance	6 > 150 N 5 > 80 N 4 > 40 N 3 > 20 N 2 > 10 N 1 > 2 N	EN 29073-4	yes	yes
Flammability of materials, visor and ancillary parts	Shall not continue to burn	EN 1146 (single burner test)	yes	yes
<p>NOTE 1: Uncoated materials shall not be tested against resistance to blocking. The test report shall be marked "Not tested against....."</p> <p>NOTE 2: If protection against hazardous chemicals is required then testing has to be carried out according to the relevant chemical standards.</p>				

4.3 Nominal protection factor (100:IL)

Ventilated protective clothing shall be classified according to table 2. Testing according to 5.4 with the necessary activity sequence according to annex A, at the minimum design air flow rate.

Table 2: Leakage

Class	Maximum value of mean inward leakage into the hood during exercise of		Nominal protection factor
	One activity %	All activities %	
5	0,004	0,002	50000
4	0,01	0,005	20000
3	0,02	0,01	10000
2	0,04	0,02	5000
1	0,10	0,05	2000

NOTE 1: Maximum value is calculated as the average performance over all test sequences. NOTE 2: Nominal protection factor is the reciprocal of the IL obtained during all activities (100 : IL)

4.4 Seam strength, Joins and Assemblages

4.4.1 Seam strength

A sample of each type of straight seam construction shall be tested in accordance with A.2 of ISO 5082 : 1982 (Constant-rate-of-traverse). Three specimens of each type of seam shall be tested and the mean of each set of three samples calculated. The garment seam performance shall be classified according to the levels of performance given in table 3 using the lowest result, i.e. the weakest seam type.

NOTE: The test method described in ISO 5082 : 1982 is only applicable to straight seams joining two pieces of material.

Table 3: Classification of seam strength

Class	Seam strength N
5	>300
4	>125
3	> 75
2	> 50
1	> 30

4.4.2 Joins and assemblages

The joins and assemblages between the suit and detachable parts e.g. between gloves and sleeves, boots and trouser legs, shall be tested in accordance with 5.5 and withstand a pull of 100 N.

4.5 Visor

The visor shall comply with table 4. Where antifogging compounds are used or specified by the manufacturer they shall not have an adverse affect on the health of the wearer, or on the clothing.

Table 4: Requirements for the visor

Properties of the visor	Requirement	Testing
Distortion of vision	the loss of sight shall not exceed two scales on the optometrical chart	to read letters on a chart at a distance of 5 m during the practical performance test according to 5.2
Mechanical strength	shall not be visibly damaged in such a way as to be likely to affect the performance of the suit system	according to EN 146

4.6 Air supply system

Couplings and connections shall comply with EN 270.

The connection between the compressed air supply tube and the suit, including attachments, threaded parts, belt or other parts, or means of stabilising the suit to the body shall withstand a 250 N pull when tested according to 5.5.

NOTE: The test should be performed before the inward leakage test.

4.7 Breathing hose

The breathing hose shall comply with the requirements of EN 270.

4.8 Air flow rate

Two suit systems shall be tested, one of which has to be preconditioned as specified in 5.1.4. When tested the air flow rate into the suit system shall not be less than the manufacturers' minimum design flow rate. The maximum flow rate shall not exceed the maximum as stated by the manufacturer. Test in accordance with 5.3

The flow rate and the distribution of the air into the suit system shall not cause distress to the wearer by local cooling. The heat stress has to be considered. Test in accordance with 5.2.

4.9 Air flow rate warning device

If an audible warning device is incorporated in the suit system it shall comply to EN 270, except for the sound pressure level which may be in the range 85dB(A) to 90 dB(A) when measured at the ears of the wearer. The frequency range of the warning device shall be between 2 000 Hz to 4 000 Hz.

Five warning devices shall be tested, one of which has to be preconditioned as specified in 5.1.4. Testing according to EN 270.

4.10 Supply valve

If a variable continuous flow valve is fitted, it shall comply to EN 270. The valve shall permit to adjust the air flow rate in the range from the minimum to the maximum as specified in 4.8. It shall not be possible to close the valve to restrict the air flow below the minimum design air flow rate.

4.11 Exhaust devices

The suit shall be provided with exhaust devices which shall continue to work correctly after the testing of the pressure in the suit (see 4.1 2), during the practical performance test (see 5.2) and during the determination of the protection factor (see 5.4). Testing in accordance with 5.6.

4.12 Pressure in the suit

The overpressure shall not exceed 1 000 Pa mean and 2 000 Pa peak. A positive pressure shall be maintained. Testing with the maximum air flow rate during the activity sequence as specified in Annex A.

4.13 Carbon dioxide content of the Inhalation air

The carbon dioxide content of the inhalation air, determined at the minimum air flow rate, shall not exceed an average of 1,0 % (by volume), tested according to EN 270. Two suits shall be tested, one of which has to be pretreated as specified in 5.1.1.

4.14 Noise associated with the air supply to the suit

The noise measured in the suit at the ears shall not exceed 80 dB(A) at the maximum manufacturers' design flow rate. Testing in accordance with EN 270. Two suits shall be tested, one of which has to be pretreated as specified in 5.1.1.

5 Test methods

5.1 Test preparations

5.1.1 Pretreatment

When the clothing is intended to be reusable the requirements for the materials or the complete clothing shall be proved after five cycles of cleaning and disinfection according to the manufacturer's instructions for use before testing.

5.1.2 Conditioning

All material samples shall be conditioned by storage at (20 ± 2) °C and (65 ± 5) % relative humidity for at least 24 h. Start each of the tests as specified in 5.1.3 and 5.1.4, within 5 min after removal from the conditioning atmosphere.

5.1.3 Visual Inspection

A visual inspection shall be carried out by the test house prior to the laboratory or the practical performance test. This may entail a certain amount of dismantling of the components of the protective clothing in accordance with the manufacturer's information for maintenance.

5.1.4 Preconditioning for the practical performance test

If the manufacturer does not state the preconditioning atmosphere for the practical performance test, the complete clothing shall be exposed:

- a) for 4 h to a temperature of (-30 ± 3) °C and allowed to return to ambient conditions, followed by
- b) for 4 h to an atmosphere of (60 ± 3) °C at 95 % relative humidity. It shall then be allowed to return to ambient temperature.

5.2 Practical performance test

5.2.1 General

The tests shall be carried out by two test persons at (20 ± 5) °C and a relative humidity of less than 60 %. The test temperature and humidity shall be recorded. The background noise shall not be greater than 75 dB(A).

The test persons shall be selected who are familiar with using such or similar protective clothing. The persons will be drawn from those people certified as fit to do so by the medical officer. The necessity of a medical examination before or supervision during the tests shall be at the testing officers discretion.

Prior to the test there shall be an examination that the suit is in working-condition and that it can be used without danger. If more than one size of clothing is manufactured the subjects are asked to select the appropriate size. Ensure that the air supply is within the specified parameters. Two suits shall be tested, each being tested on one test person.

After fitting the suit each test person is asked "Does the suit fit?". If the answer is "Yes", continue the test. If the answer is "No", replace the test person or the suit.

5.2.2 Procedure

During the test the following activities shall be done in simulation of the practical use of the suit:

- a) the test shall be completed within a total working time of 20 min
- b) walking on the level with regular rate of 5 km/h for 5 min

c) filling a small basket (see figure 1, approximate volume 8 l) with 12 mm chippings (e.g. limestone chippings) or other suitable material from a hopper which stands 1,5 m high and has an opening at the bottom to allow the contents to be shovelled out and a further opening at the top where the chippings may be returned. The person stoops or kneels as he wishes and fills the basket with chippings. He then lifts the basket and empties the contents back into the hopper. This shall be repeated 15 to 20 times in 10 min .

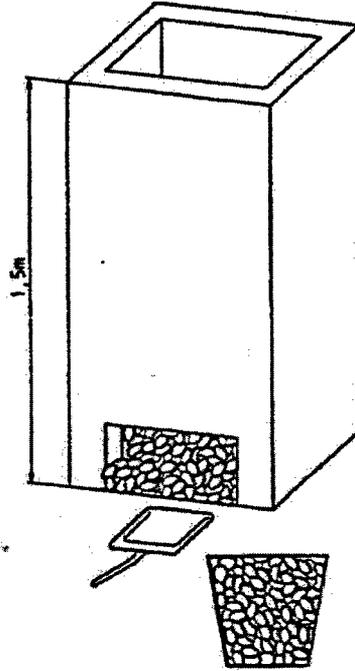


Figure 1: Hopper and basket

5.2.3 Information to be recorded

During the practical performance test the clothing shall be subjectively assessed by the wearer and the following shall be recorded:

- a) harness comfort (see 5.6);
- b) security of fastening and couplings;
- c) accessibility of controls and pressure gauge (if fitted);
- d) clarity and field of vision from the facepiece and/or visor;
- e) clothing comfort;
- f) ease of speech transmission;
- g) any other comments volunteered by the wearer.

5.3 Measurement of minimum and maximum air flow rate

Connect the ends of the distribution system collectively to a suitable measuring device. Record the maximum air flow delivered at the manufacturers' specified air supply, if a control valve is fitted, record the maximum delivered air flow and the minimum delivered air flow.

The value of minimum and maximum air flow rate shall be determined under the condition of exercise 6 of Annex A (person standing still).

5.4 Determination of the protection factor

The protection factor shall be determined in accordance with prEN 943-1. Sodium chloride test method shall be used. Activity sequences for testing are given in Annex A of this standard.

The determination has to be done at the minimum design air flow rate (see 4.8).

On two test subjects four new suits shall be tested. Two suits per test subject.

For each individual test calculate the arithmetic mean over the time period. Calculate the percentage inward leakage (IL) as follows: -

$$IL = \frac{C_2 \times 100\%}{C_1}$$

where:

- C₁ is the challenge concentration in the test chamber,
- C₂ is the mean concentration in the breathing zone for each exercise. For classification according to table 2, the average value for the four suits shall be taken.

5.5 Join and assemblage pull test

Assemble the means of attachment according to the manufacturers' information. If the assembled item (e.g. glove or boot) is itself not strong enough to apply the required pull substitute an item that is. Securely attach one part to a fixed clamp. Apply the required force longitudinally. Record at which force it parts or state that at the required force it was still complete.

5.6 Exhaust device pull test

Mount the suit on to a dummy torso which can be adjusted so that the load can be applied axially to the exhaust device. A system of retaining straps or bands is fitted over the suit around the exhaust device so that the load is applied as directly as possible to the fitting of the exhaust device in the suit.

Exert a force of (50 ± 2,5) N to the exhaust device and hold for 10 s. Repeat 10 times.

Examine the exhaust device for signs of damage or failure.

6 Marking

The marking shall comply with the specifications of EN 340 with the pictogram as given in figure 2.

The level of performance of the inward leakage (IL) shall be marked as:

IL : class x (x = class number according to table 2).

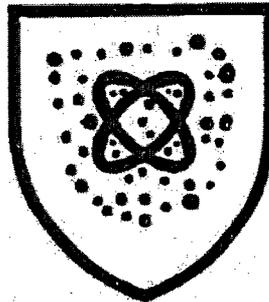


Figure 2: Pictogram

7 Information supplied by the manufacturer

The information supplied shall be at least in the official language(s) of the country or region of application. The manufacturers' information shall comply with the specifications of EN 340. The following information shall be supplied additionally:

- instructions for donning, using, fitting, removing and storing;
- application, limitations of use (classification, temperature range etc.);
- tests to be carried out by the wearer before use (if required);
- maintenance and cleaning and decontamination by e.g. showering (if required).

The manufacturers shall specify the required supply pressure and flow range necessary to maintain protection.

Warnings (if appropriate) shall be given against problems likely to be encountered, as e.g. heat stress, depending on the air flow rate, work load, environmental atmosphere etc.

Annex A (normative)

Activity sequence for the testing of the protection factor

Table A.1: Activity sequence for the testing of the protection factor

No	Activity sequence for the testing	Time of activities min
1	dress person in the suit	
2	don boots, gloves etc. as required according to the manufacturers instructions	-
3	person to enter test chamber, connect tubing to the sample point - no test agent	3
4	establish background reading at sample point with person standing still - no test agent	3
5	start test agent and allow to stabilize	3
6	record leakage and pressure at sample point with the person standing still	3
7	start treadmill	-
8	walk	3
9	record leakage and pressure at sample point with the person walking at about 5 km/h	-
10	stop treadmill	-
11	record leakage and pressure at sample point, person moving arms up and down above head height and looking upward, e.g. lifting object (half brick) from desk to shelf level	3
12	record leakage and pressure at sample point, person doing continuous squats	3
13	stop test agent and allow to disperse with person in chamber	3
14	disconnect sample tubes and remove person from test chamber and undress subject	-
<p>NOTE: The total trial may vary, all times are approximate and are to stable conditions. When doing squats, a slow deliberate action is required, say continuously during about 3 s. Analyse results over final 2 min of each exercise period to avoid carry over of result from one exercise to the other. Record challenge chemical continuously using a separate detector (if possible). Record the pressure inside the suit over the whole time.</p>		

Annex ZA (informative)

Clauses of this European Standard addressing essential requirements or other provisions of EU Directives

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive 89/686/EEC.

WARNING: Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

The following clauses of this standard are likely to support requirements of Directive 89/686/EEC, Annex II:

EU-Directive 89/686/EEC, Annex II	clauses of this standard
1.1 Design principles	4.1, 4.2, 4.3, 5.5.1 to 5.6
1.2 Innocuousness of PPE	4.1, 4.5, 4.14, 5.2
1.3 Comfort and efficiency	4.1, 4.3, 5.2, 5.4, annex A
1.4 Information supplied by the manufacturer	clause 7
2.2 PPE 'enclosing' the parts of the body to be protected	4.1.4, 4.5, 4.8, 5.2
2.3. PPE for the face, eyes and respiratory tracts	4.5, 5.2
2.1.2 PPE bearing one or more identification or recognition marks directly or indirectly relating to health and safety	clause 6
3.9.2.1 Protection against external radioactive contamination	clause 4, 5, 6, 7

Compliance with the clauses of this standard provides one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

Enclosure 5.3 to Attachment 1

CNRO-2006-00021

Certificate No. 0073/197/162/02/01/0005 for Mururoa V4F1 R

INSTITUTE FOR NUCLEAR PROTECTION AND SECURITY

Technical Center for Nuclear Equipment Certification

In accordance with the directive 89/686/EEC dated December 21th 1989 comparing the laws of the States Members Legislations relative to the Personal Protective Equipments, and the decrees n° 92-765, 766 and 768 dated July 29th 1992 transposing the directive into French Laws.

The organisation herebelow mentioned (PSN / CTHEN) whose references are as follows:

- Address: CEA / Saclay – Building 389 – 91191 Gif-Sur-Yvette Cedex – France.
- Empowered by Order of the Ministries of Employment and Agriculture dated December 24th 1996.
- Identified under the n° 0073 (published in the EEC Official Publication dated July 23th 1994).

Assigns the :

EC TYPE EXAMINATION CERTIFICATE
N° 0073 / 197 / 162 / 02 / 01 / 0005

To the following Personal Protective Equipment model:

- Designation: Ventilated Protective Suit against Radioactive Contamination due to particles, pressurised for a single use only.
- Commercial reference : **MURUROA V4F1R – ref. 848 1X5 T.**
- Manufacturer : DELTA PROTECTION / REDI – 69210 Saint-Germain-Sur-L'Abresle.
- Certificat applicant : DELTA PROTECTION – Z.A. De Berret-30200 Bagnols-sur-Cèze.
- Essential Requirements Reference : EN 1073-1 (March 1998), EN 340 (December 1933).

Date : February 21TH 2001
J. CORBIERE/ Chief of CTHEN

Nota : According to article R 223-62 of the "Working Law", the empowered organisation should be informed of any modification made to the material subject of this EEC type examination certificate, as well as of any modification made to the contents of this technical file on which the delivered type certificate was based on (address, manufacturer name, quality insurance certificate extract, ...)

This certificate contains 16 pages n° 1/16 to 16/16.

1. DESCRIPTION

It is a Ventilated Protective Suit against Radioactive Contamination due to particles ventilated type – pressurised for one use only, its name is:

MURUROA V4F1 R– ref. 848 1X5 T.

The X values are defined according to the pipe butt (Staubli or CEJN) allowing to connect the suit to the breathable compressed air supply system.

The T values are defined according to the size of the suit.

The attached list – annex 1 – gives all the references defined by this AET.

Diagrams and pictures of the **MURUROA V4F1 R – ref. 848 1X5 T** are presented in annex 2 & 3.

It includes mainly the following elements:

- A air tight suit with an incorporated hood.
- A suit fastening system located on the back of the suit.
- A breathable air flow supply system including a flow control valve named “flow control valve” describe at the end of the chapter.
- A air exhaust device.
- A safety strip for emergency opening.
- A undressing strip.
- Reinforced pieces on elbows, feet and knees.
- Accessories: A tunnel for the phonic link cable and one for safety harness, a protective sleeve for the flow control valve, a dosimeter window, a loop placed on the back for holding the air supply pipe.

The internal clothing flow rate cannot be adjusted directly by the user with a valve. Connection to the breathable air network carried out by a system named “Flow control valve”, provided with Staubli or CEJN butt, this device control the feeding flow rate within the limits fixed by the manufacturer, when pressure of the breathable air network is between 2.5 and 7 bar

1.1. MAIN MATERIALS

Skin of the suit:

PVC 9013 formulation 1010, 20/100 mm thickness (pink color).

Hood :

PVC Cristal 068 – 30/100 mm thickness.

Ocular :

PVC (astraglass) 50/100 mm thickness.

Gloves:

PVC model DELTASOFT (distributed by the firm DELTA PROTECTION), size 9-9 1/2 whatever to the size of the suit.

Slippers:

PVC 9013 – formulation 1010 – 20/100 mm thickness
Non slippy PVC sole type "diligence".

1.2. COMPONENTS

- **Internal Ventilation System:**

The suit is connected to the breathable pressurised air supply system through a device named " flow control valve" with a STAUBLI or CEJN type butt. The air flow, inside the suit, is distributed by an internal network, manufacturer reference "Integral ventilation V4 type".

- **Exhaust :**

The exhaust system is composed of two exhaust valves located on the back of the hood and on the back of the suit.

- **Fastening device:**

A dual zipper system located vertically on the back of the suit.

- **Other components:**

The suit includes:

- A safety strip for an emergency opening located on the hood.
- A undressing strip.
- A tunnel for phonic link.
- A Loop, on the back of the suit, for holding the air supply pipe system.
- Several reinforced pieces on the elbows, knees, between legs, and the air supply inlet.
- Accessories: A tunnel for safety harness, a protective sleeve for the flow control valve, a dosimeter window.

2. CONFORMITY TO REQUIREMENTS

2.1. REQUIREMENTS FOR THE MATERIALS (except accessories: Gloves, slippers...) (see paragraph 4.2. of EN 1073-1)

2.1.1. Abrasion Resistance

Test according to the EN 530 – method 2 (abrasive paper 00) standard. The classification is carried out according to the following diagram :

Class	Number of cycle
6	> 2 000 cycle
5	> 1500 cycle
4	> 1 000 cycle
3	> 500 cycle
2	> 100 cycle
1	> 10 cycle

Results : Class 6 for PVC 9013 formulation 1010 - 20/100 mm thickness.
Class 6 for PVC Cristal – 30/100 mm thickness.

2.1.2. Flexcracking Resistance

Test according to the ISO 7854 – method B standard. The classification is carried out according to the following diagram:

Class	Number of cycle
6	> 100 000 cycle
5	> 40 000 cycle
4	> 15 000 cycle
3	> 5 000 cycle
2	> 2 500 cycle
1	> 1 000 cycle

This test is not applicable to suits for single use only.

2.1.3. Puncture Resistance

Test according to the EN 863. The classification is carried out according to the following diagram :

Class	Puncture resistance
3	> 100 N
2	> 50 N
1	> 10 N

Results: Class 1 for PVC 9013 formulation 1010 - 20/100 mm thickness.
Class 2 for PVC Cristal – 30/100 mm thickness.

2.1.4. Blocking Resistance

Test according to the EN 25978 standard. The classification is carried out according to the following diagram:

Class	Comments
2	non stick
1	sticky

This test is not applicable to single use suit and to non coated materials.

2.1.5. Tear Resistance

Test according to the EN 29073-4. The classification is according to the following diagram :

Class	Applied strength
6	> 150 N
5	> 80 N
4	> 40 N
3	> 20 N
2	> 10 N
1	> 2 N

Results : Class 3 for PVC 9013 formulation 1010 - 20/100 mm thickness.
Class 4 for PVC cristal 30/100 mm thickness.

2.1.6. Flammability of materials, visors, and auxiliary parts

Tests are carried out according to the EN 1156 standard– single burner test (paragraph 7.5.3).

Results: Test requirements entirely fulfilled.

2.2. ACCESSORIES REQUIREMENTS

2.2.1. Gloves

The MURUROA V4F1R -3– ref. 848 1X5 T suit is fitted with gloves which comply with the specific requirements for this type of individual protective equipment, more particularly with the requirements of the norm EN 421 "Protective gloves against ionizer rays and radioactive contamination". They have a particular EC Type examination based on the contracted tests.

2.2.2. Slippers

The slippers are integrated part of the suit. They are made of the same material; They include a non-slip sole, they comply with the requirements of the norm EN 1073-1; Therefore, considering the important risk of damage which can happen at the level of the feet and consequently the loss of tightness against radioactive contamination, this equipment must not be used without an additional protection (boots or over boots with EC marking).

2.3. REQUIREMENTS FOR THE PROTECTIVE SUIT

2.3.1. Suit design

the suit must comply with the general requirements of the EN 340 standard.

2.3.1.1. Ergonomics (paragraph 4 of EN 340 standard)

- **Materials and components of the suit :** Must be reputed good for the user.
Results : The parts of the suit which can be in contact with the wearer skin are made of PVC (see paragraph 1.1); The manufacturer certifies, in the technical file and the user manual, that the materials of the suit are well known for having no bad effects on the skin.
- **Protection and comfort level :** See paragraph 2.3.2. (Practical Performance Test).
Results : Requirements entirely fulfilled.
- **Parts of the suit being in contact with the wearer :** they must be without any roughness nor sharp edges that could create inflammations or wounds.
Result : Requirements entirely fulfilled.

- **Adjustment of the suit** : This requirement is tested during the Practical Performance Test (the suit has no adjusting device, size must be chosen according to the user height).
- **Result** : Requirement entirely fulfilled.
- **Weight of the suit** : It must be as light as possible and therefore resistant and efficient. This requirement is evaluated during the tests on the materials and on the complete suit.
- **Result** : Requirements entirely fulfilled.

Steam Permeability: This requirement cannot be tested due to the suit design (PVC material) and due to its protective level. The user comfort is due to the internal air flow supply.

2.3.1.2. Weariness (EN 340 - paragraph 5)

The suit is for single use only.

2.3.1.3. Sizes – Marks – Manufacturer Information (EN 340 – paragraph 6 to 8)

The controls results are mentioned in chapter 3 annex 1.

2.3.1.4. Dressing / Undressing (EN 1073-1 - paragraph 4.1.2.)

The suit must be designed to be put on and out very easily and to reduce the risk of Contamination. This requirement is evaluated during the Practical Performance Test (see paragraph 2.3.3.)

The dressing and the undressing must comply with the user manual and the Operating advices; the user is helped by an assistant. Using safety strips limits the risks of contamination when undressing. They are also used in case of emergency.

Result : Requirements entirely fulfilled.

2.3.2 Practical Performance Test

The Practical Performance Test is carried out according to the EN 1073-1 (paragraph 5.2.). The conditioning is according to the manufacturer instructions for use.

Parameters	Valuations
a) Harness comfort	Aimless
b) Security of fastenings & couplings	Good
c) Accessibility of adjusting devices	Aimless
d) Clarity of vision through visor	Conform (see Chapter 2.3.6)
e) Suit comfort	Good
f) Speaking transmission facility	Aimless
g) Other parameters	No particular notice

2.3.3. Airflow supply system (EN 1073-1 – paragraph 4.8.)

The manufacturer estimated air flow rates, for a relative air flow supply pressure between 2.5 to 7 bar, as indicated herebelow:

	Output (N m ³ .h ⁻¹)	Output (N l.min ⁻¹)	Relative pressure Of Air flow supply (bar)
Minimum	27	450	2.5
Maximum	45	750	7

The internal flow rate cannot be adjusted directly by the user with a valve, the flow rate is adjusted by the "Flow control valve", depending of the breathable air network pressure.

According to the EN 1073-1 (paragraph 5.3); the suit have been test with the manufacturer pressure specified.

The air flow rate inside the suit must not be :

- Below the minimum value estimated by the manufacturer (Dmin),
- Superior to the maximum value esitimated by the manufacturer (Dmax)

The air flow feeding the suit have been check through a massic flow meter and according this parameter:

- Increasing the pressure from 0 to 7 bar by 1 bar step, plus one check at 2.5 bar.
- Decreasing the pressure from 7 to 1 bar by 1 bar step, plus one check at 2.5 bar.
- Direct connexion to 10 bar, adjustment to 7 bar , decreasing the pressure from 7 to 1 bar by 1 bar step, plus one check at 2.5 bar.
- Connexion/Disconnexion at 2.5 bar.

During the test, the flow rate was conform to the manufacturer specification.

Results: Requirements entirely fulfilled.

2.3.4. Inward leakage average – Fit Factor (paragraph 4.3. of EN 1073-1)

The ratio of the average inward leakage has been measured according to the draft pr EN 943-1 (annex A) standard. According to the Sodium Chloride Method.

The Fit Factor is equal to 100/IL. (IL) being the average value of the Inward Leakage (in %) calculated on the whole lot of trainings and the whole lot of suits.

Measurements have been performed under the following conditions :

- Air flow rate: Adjusted and maintained on minimum flow rate (D min) as indicated in paragraph 2.3.3.
- Trainings sequence: According to the EN 10731 Annex A list.
- Suit preliminary conditioning: According to the advice of the user manual.

The samplings are taken from the hood, outside the breathing device.

The ratio of the average inward leakage gives the following classification:

Ventilated pressurised Suit classification	Maximum accepted values, in %, of the ratio of the average Inward Leakage inside the hood, calculated on the whole lot of suits		FIT FACTOR
	For One activity	For all activities	
5	0.004	0.002	50 000
4	0.010	0.005	20 000
3	0.020	0.010	10 000
2	0.040	0.020	5 000
1	0.100	0.050	2 000

Results: The suit is classified Class 5 suit.

2.3.5. Seams, Joins and Assemblages pull test resistance

2.3.5.1. Seams / welds (paragraph 4.4.1. - EN 1073-1)

A sample of each type of weld is tested according to the Norm ISO 5082 (annex 2). The weld performance level is according to the following classification:

Class	Seam resistance (N)
5	> 300
4	> 125
3	> 75
2	> 50
1	> 30

Results: All the welds are classified 4.

2.3.5.2. Joins and Assemblages (paragraph 4.4.2. – EN 1073-1)

This suit has no joins nor assemblages. This paragraph is aimless.

2.3.6. Ocular (paragraph 4.5. – EN 1073-1)

The vision distortion is measured, during the Practical Performance Test, by reading letters on an optometrical chart placed at a distance of 5 m; The loss of vision must not exceed 2 degrees.

The mechanical resistance test of the visor is according to the EN 146 (paragraph 6.7.).

Results : Vision distortion : Up to requirement.
Mechanical resistance: up to requirement.

2.3.7. Air supply system (paragraph 4.6. of EN 1073-1)

The connection between the compressed breathable air supply pipe and the suit must correspond to the paragraphs 6.7.1., 6.7.2., and 6.11.7. of the EN 270 standard. It must withstand a 250 N pull.

This connection is achieved, on the flow control valve, through a quick coupling, air proof, with automatic stop valve, model STAUBLI or CEJN; This device allows the air supply pipe to turn freely around its axle in order to avoid accidental disconnections.

Results: Conformity for design and mechanical resistance.

2.3.8. Breathing Hose (paragraph 4.7 of EN 1073-1)

Tests are performed according to the EN 270 (paragraphs 7.2. and 7.6.) The pipe must not block the movements, nor cause disconnection during the practical performance test.

Results: Requirements entirely fulfilled.

2.3.9 Air flow rate warning device (paragraph 4.9 of EN 1073-1)

If a warning is fitted, it must comply to the EN 270 standard (paragraph 6.13.3. and 7.12.) The sound level must be between 85 dB(A) and 90dB(A).

Results: Aimless (there is no warning device).

Remarks: The Mururoa V4F1R does not include low rate flow indicator; Air flow rate control devices have to be placed at the wearer disposal. (See paragraph 3.2 "Manufacturer information").

2.3.10 Air supply valve (paragraph 4.10 of EN 1073-1)

The air flow rate supplied in the suit has a relative pressure whose limits are fixed by the manufacturer. The air supply valve allows to adjust the flow between the minimum and the maximum values as indicated in the technical manual. The valve cannot be closed to reduce the air flow rate under the minimum given value.

Result: Aimless, the suit have not an adjustable valve.

2.3.11. Exhaust devices (paragraph 4.11. of EN 1073-1)

The exhaust devices must work correctly after the testing of the pressure in the suit, during the Practical Performance Test and during the determination of the Fit Factor. Test in accordance with the EN 1073-1 standard (paragraph 5.6.).

Results : Good exhaust system working.
Pull resistance superior to the fixed limit.

2.3.12. Pressure in the suit (Paragraph 4.12. of EN 1073-1)

During the activity sequence as specified in Annex A of the EN 1073-1 standard, the overpressure shall not exceed 1000 Pa mean and 2000 Pa peak. A positive pressure shall be maintained.

Test is performed with maximum air flow rate D max, as stipulated in paragraph 2.3.3.

Result: Requirements entirely fulfilled.

2.3.13 Carbon dioxide content in Inhalation air (paragraph 4.13. - EN 1073-1)

The CO₂ content of the inhalation air, determined at the minimum air flow rate, shall not exceed an average of 1 % (by volume), tested according to the EN 270 standard (paragraph 7.15) with the minimum air flow rate D min indicated in paragraph 2.3.3.

Result: Requirement entirely fulfilled.

2.3.14 Noise associated with the air supply to the suit (paragraph 4.14 - EN 1073-1)

Test according to the EN 270 standard (paragraph 7.16). The noise measured in the suit at the ears shall not exceed 80 dB(A) at the maximum air flow rate as indicated by the manufacturer. Tested at the maximum air flow rate D max as stipulated in paragraph 2.3.3.

To check the flow control valve functioning, measurement has been done during the flow rate control (cf paragraph 2.3.3) at each flow rate step.

Result : Requirement entirely fulfilled.

3 CHECKINGS

3.1. MARKING (paragraph 6 of EN 1073-1)

The marking complies with the requirements of the Norms EN 340 and EN 1073-1. According to the Decree dated February 7TH 1997 "relative to EEC marking of the working equipment and of the Personal Protective Equipment", it includes the distinctive number of the entitled organisation for the procedure of controls of the manufactured PPE (article 11 of the EEC Directive 89/686/EEC).

The symbol "i" is included in the pictogram, in order to show that the manufacturer instructions should be read by the user.

3.2 MANUFACTURER INFORMATION

Firstly, the manufacturer reminds the user of referring to the requirements of the European Directive 89/656/EEC dated November 30th 1989, which defines the duties of the employers concerning the choice and the use of PPE.

This Directive precises (section II – articles 4 & 5) that, before choosing an individual protection suit, “the employer must value the PPE he is going to use” according to the following :

- “Analysis and valuation of the risks”
- “Definition of the necessary characteristics in order the PPE complies with the risks”
- “Valuation of the characteristics of the available PPE”.

The employer has to “define the conditions of use, specially the wearing time according to the risks importance” (in case of this suit : according to the radioactive contamination level”, “frequency of exposure to the risk and the working conditions of each worker together with the performances of the individual protection equipment”.

The content of the information note complies with the requirements of the Directive 89/686/EEC dated December 21th 1989 (annex II – article 1.4.), to the specifications of the Norms EN 340 paragraph 8 and EN 1073-1 paragraph 7; The manufacturer directives are mainly as follows :

- Storage : Environmental conditions and maximum period.
- Cleaning, maintenance and revision : This chapter is aimless. The **MURUROA V4F1R** is a single use suit.
- Protection levels according to the Norm EN 1073-1 : Protection Factor, mechanical resistance of the suit components and of the gloves.
- Conditions for good protection levels : Air flow rate between 450 N l.min-1 and 750 N l.min-1 when the suit is supplied with a relative pressure between 2.5 to 7 bar.
- The compulsory accessories for the good working of the **MURUROA V4F1R** : One pair of boots or overshoes , or safety boots having the EC marking.
- The conditions of use : Mostly the characteristics of the air flow supply connections, the ancillary controls devices, the supervision and emergency devices for the user.
- The instruction for use :
 - o How to put the suit on and how to put it out.
 - o Emergency devices and reaction of the user in case of failure of the air flow supply system.
- The limits of use of the **MURUROA V4F1R** suit :
 - Delivered without air flow rate indicator; Before any work, the user will have to provide himself with necessary devices to check if the minimum air flow rate, as indicated by the manufacturer, is reached or exceeded before and during wearing the suit.
- The date of manufacturing and life time limit.
- The marking meaning.
- The references of the notified organisations having taking part in the “designing” phase.

3.2. MAINTENANCE MARKING

This is aimless. The suit being for single use only.

4. CONCLUSIONS

Upon presentation of the tests results and of the controls carried out, and after investigations of the manufacturer technical manual, the *Ventilated Protective Suit against Radioactive Contamination, Pressurised, for Single Use Only, MURUROA V4F1R– Ref. 848 1X5 T*, is certified to assure protection against radioactive particles contamination according to the following conditions :

- Feeding breathable air pressure included from 2.5 to 7 bar.
- Minimum air flow rate : 27 N m³.h⁻¹ (450 N l.min⁻¹)
- Maximum air flow rate : 45 N m³.h⁻¹ (750 N l.min⁻¹)
- This have not adjustable flow valve.

ANNEX 1

Description and references of the equipments certified in the EC Type Examination Certificate

The different models of equipment, whose generic appellation is MURUROA ref. 848 1X5 T., and which are the subject of this EC type examination certificate, are only different on the following points :

- The butt type connecting the equipment to the breathable compressed air supply system.
- The size.

X indicates the butt type according to the following values:

References	Type of butt for connection to the compressed air Supply system	References of MURUROA V4F1R associated
X=2	Staubli RBE 06 6150	848 125 T
X=4	CEJN 342	843 145 T
X=8	Staubli RBE 06 QR	843 185 T

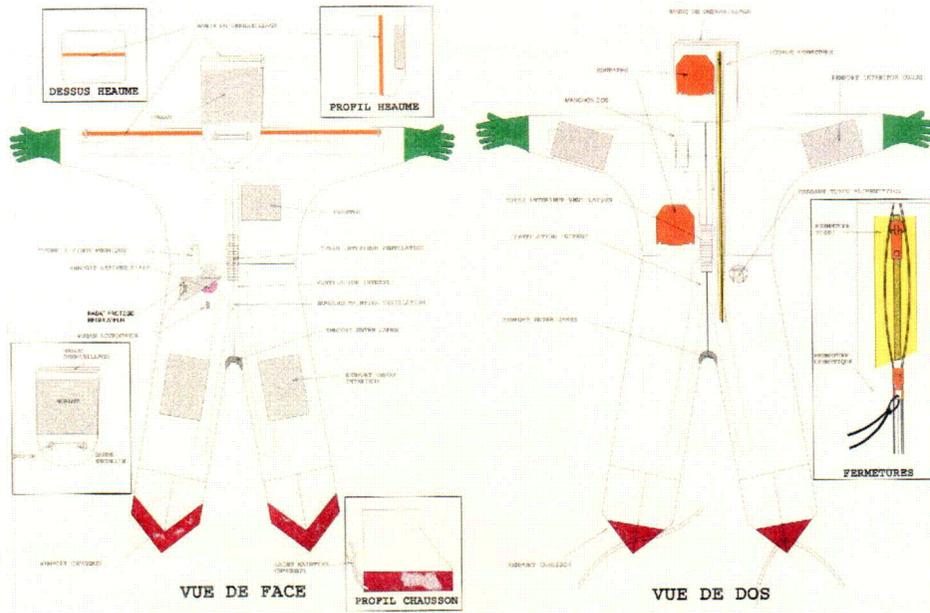
Y indicates the size of the suit according to the following values:

REFERENCE	Height (cm)	Waist measurement (cm)
T=0	152-164	56-64
T=1	164-170	64-68
T=2	170-176	68-72
T=3	176-182	72-76
T=4	182-188	76-80
T=5	188-200	80-88
GT	182-188	80 flat (1,60 m of waist)

ANNEX 2

Diagrams of the suit

MURUROA V4F1R- ref. 848 1X5 T



Annex 3

**Picture of the suit
MURUROA V4F1R - ref. 848 1X5 T**



Enclosure 5.4 to Attachment 1

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Donning and Removal Instructions for Mururoa V4F1 R

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MURUROA V4 F1 R®
INSTRUCTIONS FOR USE
EPI 848 1X5 T


DELTA PROTECTION

☎ 04 66 89 18 36

DELTA PROTECTION
Z.A du Berret
30200 BAGNOLS-SUR-CEZE - FRANCE
☎ (33) 04 66 89 18 36
☒ (33) 04 66 89 36 31

GARMENT PROTECTING AGAINST RADIOACTIVE CONTAMINATION IN PARTICLE FORM, VENTILATED-PRESSURISED TYPE WITH A FLOW REGULATOR, SINGLE-USE, COMPLIANT WITH STANDARD EN 1073-1 (MARCH 1998).

- Warning :**
- The choice and use of personal protective equipment must comply with European Directive no. 89/656/EEC of 30/11/1989.
 - The employer must have first analysed and assessed the risks involved in the intervention and those generated by the use of the personal protective equipment selected.
 - In this approach, he may by default take inspiration from the stages described in "Guide for the selection and use of protective breathing apparatus" published by AFNOR under the no. S 76-005 CR 529. The operator's analysis must also take into account any obstacles to the rapid removal of the equipment in the event of an incident as well as the radiological consequences for the worker concerned by such removal.

Preamble : • This disposable garment has been developed to offer protection against radioactive contamination in particle form according to standard EN 1073-1. It is designed for use with a breathable air network supplying air at a pressure between 2.5 and 7 bar inclusive.

- This garment is for use under the supervision of the person in charge of the intervention, who will in particular have ensured in advance that:
 - This garment offers adequate protection for the category of risks encountered during the intervention.
 - The wearer is in possession of the necessary alarm devices allowing him to check that the minimum air flow foreseen by the manufacturer is reached or exceeded before and during the use of the equipment (for the necessary equipment, please consult us).
 - The air supply hoses are compliant with standard EN 270 and are of sufficient length.
 - "Breathable air" points (compliant with standard EN 12021) fitted with connectors compatible with those on the suit are in fact placed at different places where the user may have to go
 - And that these air points provide a sufficient quantity of air.

→ Supply range from 2.5 to 7 bar (the air flow rate will then be between 450 and 750 l/min inclusive)

- That the whole of the intervention is supervised (person present or by audiovisual means) and that all the necessary rescue equipment is available in the event of an incident during the intervention.

Remark: The suit does not have a manual air flow adjustment valve, the supply flow is controlled automatically.

DONNING THE SUIT (see also diagrams on the label on the back valve)

- The wearer, assisted by a dresser, makes a visual inspection of the condition of the suit and its components, then removes the transport protection (cardboard on the visor, inside the suit and detachable "crystal" on the visor).
- He pulls on the bottom of the suit via the back closure.
- He connects up to the breathable air network passing his air line through the loop situated at the back of the suit at supply system height.
- The dresser then closes the two zippers and applies a strip of adhesive to the full length of the zippers to ensure they are sealed; he ties the laces of the overboots around the ankles. The suit must be used with textile overboots or safety boots.
- The wearer checks the air supply, the correct operation of the flow regulator and overpressure valves by crouching rapidly several times.
- He may now enter the work zone.

DOFFING THE SUIT

- The suit can be removed using the strip provided for the purpose. To do this, as the garment is still being supplied with air, the undresser pulls on the orange strip that runs from one wrist to the other passing over the helmet and rolls down the front and back parts of the garment so as to trap the contamination and avoid any contact with the worker.
- In case of need the helmet must be able to be removed rapidly. Beware of any extra devices that may interfere with its removal (external harness, adhesive strips...).

IMPORTANT

- If the garment loses pressure during the intervention, if mist appears inside the helmet or if the worker feels excessively hot, he must leave the work zone immediately.
- Remember that: the suit remains pressurised for a few moments even if the air supply is cut off.

STORAGE

In the original packaging: away from direct light; at a temperature between + 5°C and + 45 °C inclusive.
Possible storage time: 3 years in the original packaging.

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EMERGENCY DEVICES

- The safety strip placed at the front of the helmet, when it is pulled off, allows the wearer to breathe the air outside the suit
- Tearing off the doffing strip allows the wearer to get out of the top half of the suit in less than 5 seconds.

ERGONOMICS

The composition and presentation of the materials used mean that they are not dangerous or harmful in any way (no risk of skin damage...) for the wearer of the equipment.

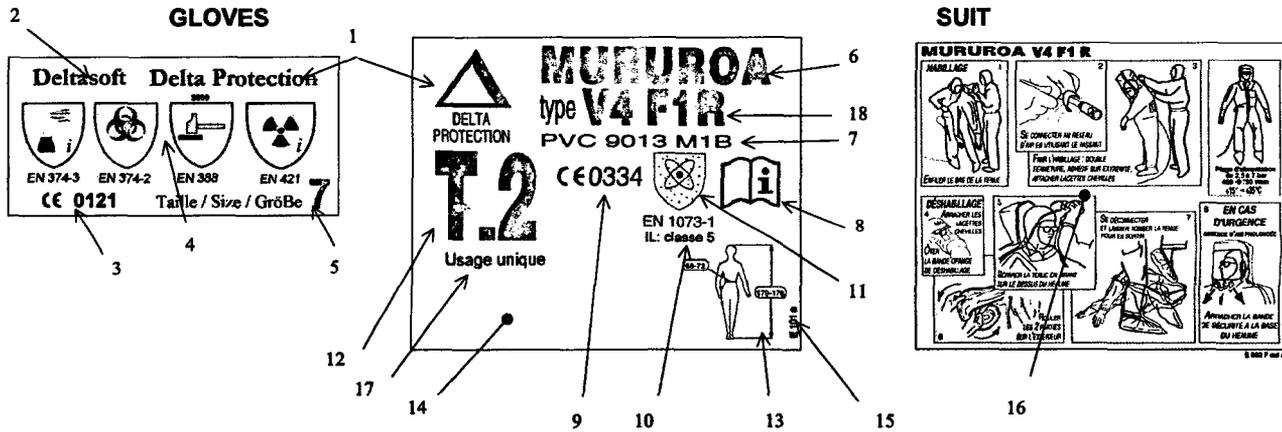
REMARK:

Single use garment.

MATERIALS PERFORMANCE

Test typ	Standard	Performance level
PVC 20/100	EN 1073-1	Not applicable disposable garment Class 6 (> 2000 cycles NF EN 530) Class 1 (>10 N NF EN 863) Class 3 (> 20 N NF EN ISO 9073-4) Requirements met (EN 1146)
PVC Cristal 30/100	EN 1073-1	Not applicable disposable garment Class 6 (> 2000 cycles NF EN 530) Class 1 (>10 N NF EN 863) Class 3 (> 20 N NF EN ISO 9073-4) Requirements met (EN 1146)
Results with respect to whole suit	EN 1073-1	Protective clothing Class 5. Designates the nominal protection factor of the suit (Class 5: nominal protection factor of 50 000)
	ISO 5082	Strength of welded seams: class 4 (> 125 N)

MARKING



POSITIONING:

The marking on the glove is situated on the back of the hand, the labels are on the two exhaust valves situated on the helmet and on the back of the garment.

1: Manufacturer's name.

2: Identification of the model of glove.

3: CE marking. The glove meets the standards relating to type 11b production monitoring. "0121" is the identification number of the body in charge of controlling production.

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4:



EN 374-3 Pictogram indicating that the glove offers protection against chemical risks. Results in the EN 374-3 tests: Level 6 glove. (ammoniac solution 10 %, caustic soda 40 %, sulphuric acid 80 %).



EN 374-2 Pictogram indicating that the glove offers protection against micro-organic risks. Results in the EN 374-2 tests, air permeability test: passed.



EN 388 Pictogram indicating that the glove offers protection against mechanical risks. Results in the EN 388 tests: Abrasion resistance: level 3.

Resistance to cutting: level 0.

Tear resistance: level 0.

Puncture resistance: level 0.



EN 421 Pictogram indicating that the glove offers protection against radioactive contamination in particle form, in accordance with standard EN 421.

5: Glove size.

6: Identification of the model of garment.

7: Main material of the garment and its fire rating: according to NFP 92 507: M1 according to NFG 07 184: B

8: The "open book" pictogram indicates the need to read the instructions for use.

9: CE marking. The garment meets the standards relating to type 11 b production monitoring. "0334" is the identification number of the body in charge of controlling production.

10: EN 1073-1: Requirements and test methods for ventilated suits protecting against radioactive contamination in particle form. IL: Class 5. Indicates the nominal protection factor of the garment (Class 5: Average protection factor equal to 50 000)



11: EN 1073-1 Pictogram indicating that the garment offers protection against radioactive contamination in particle form, in accordance with standard EN 1073-1.

12: Garment size.

13: Indicates the measurements of the different sizes.

14: Space for the date of manufacture, batch number and use-by date.

15: Number and reference of the revision of the label.

16: Label stuck onto the back valve showing how to don and doff the suit and what to do in an emergency.

17: Garment approved for single use according to standard EN 1073-1.

18: Type of internal ventilation of garment: type V4 F1 R.

The CE Type examination was done by:

CTHEN

CEA Saclay Batiment 389

91 191 Gif sur Yvette

tel:01-69-08-36-80

Notified body identification number: 0073

ATTACHMENT 2

CNRO-2006-00021

List of Regulatory Commitments

List of Regulatory Commitments

The following table identifies those actions committed to by Entergy in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE- TIME ACTION	CONTINUING COMPLIANCE	
The Mururoa V4F1 R suit will be integrated into Entergy Operations Inc. station respiratory program using the information provided by the manufacturer.		X	Before use of suit
New lesson plans will be developed to train workers on the Mururoa's features, donning, use and removal, cautions and use of mouth strip, and tear off strips for routine and emergency egress.		X	Before use of suit
Radiation Protection personnel will be provided additional training for the Mururoa suit including selection, approval, issue, equipment set-up, operation, and maintenance instructions.		X	Before use of suit
All suits and cartridges will be treated as "Single Use" only.		X	Before use of suit
The suit system will not be used in an Immediately Dangerous to Life and Health (IDLH) environment.		X	Before use of suit
Entergy will use the Corrective Action Program to document and evaluate any unexpected problems with the suit		X	Before use of suit
Entergy will report any defects in a timely manner to the U.S. Nuclear Industry through our operating experience process.		X	Before use of suit