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KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	MATERIAL STANDARD FOR FIRE FIGHTING HEAT RESISTANT EQUIPMENT (PROJECT STANDARDS AND SPECIFICATIONS)	

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SCOPE

This Project Standard and Specification specifies the minimum requirements for the following equipment:

- a. Fire resistance suit
Against radiant heat and flame lick.
- b. Fire resisting blanket
Glass fiber for extinction of fire.
- c. Fire blankets
For personal protection.
- d. Fire resisting curtain
To provide fire and heat guard for separation of hot gas, flame and smoke in movies (cinemas), theaters etc.
- e. Fire resisting shield
For protection of fire fighters against heat and fire.

REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

1. BSI (British Standard Institution)

BS 3120	“Performance Requirement of Materials for Flame Proofing”
BS Handbook NO 11	“Method of Tests for Textile”
BS EN 367	“Protective clothing heat transmission”
BS EN 180 6942	“Protective clothing method of test”
BS EN 531 (1995)	“Protective clothing for industrial workers exposed to heat”
BS 3119	“Method of Test Flameproof Materials”
BS 3791 EN 367 (92)	“Protective clothing – protection against heat and fire”
BS 7944	“Heavy Duty Fire Blanket”
BS EN 1869	“Fire blankets”
UL 96	“Standard for safety lightning Protection Components”

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2. NFPA (National Fire Protection Association)

NFPA 101	“Life Safety Code”
NFPA 701	“Fire test for flame propagation of textiles”
	National Safety Council Accident Manual for Industrial Operations Chapter 38(6 th Edition)

DEFINITIONS AND TERMINOLOGY

Aluminized Clothing - Aluminized Clothing with range of Ceramic Fiber (1450° C) clothing made of aluminized coated flameproof fabric which reflects and insulates heat and fire for short period of time and are of two types:

- Fire proximity or reflective suit used in proximity of high temperature where flame is not entered or is designed to provide protection against conductive, convective and radiant heat.
- Entry clothing protective clothing that is designed to provide protection from conductive, convective and radiant heat and permit entry into flame.

Fire Resisting Curtain - A fixed wall type curtain fixed above the proscenium opening which in case of stage fire automatically closes without the use of applied power.

Fire Resisting Shield - A local made shield to be used by fire fighters to combat intense flame and heat such as oil well fire.

UNITS

This Standard is based on International System of Units (SI) except where otherwise specified.

SPECIFICATION FOR FIRE RESISTANCE SUITS

Structural (Fire Fighter, Suit)

Where men are working in extremely high temperatures up to 1000 to 1100°C, such as furnace and oven repair, cooking, slagging, fire fighting and rescue work, the use of aluminized fabrics are essential.

- a. Combination of “CELANECE pbi” Fiber (25%) and “CONEX” META ARAMID Fiber (75%). The flame resistant outer shell shall not break nor lose the

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inherent flexibility after the exposure to 1200°C flame for period of more than 65 seconds.

- b. For use by the structural fire fighters encountering dangerous radio- activity pollution hazards and radioactive contamination during the fire fighting operation and related life saving operations at the “Hot Job” places.

These suits consist of:

- Trousers
- Coats
- Gloves
- Boots
- Hoods
- One piece from head to foot
- Air-Fed to reduce heat and increase comfort.

1. Aluminized clothing

Aluminized Clothing with range of Ceramic Fiber (1450° C) this type of clothing falls into two classes:

- a. Emergency suits (Figs. 2 and 3)
For temperature exceeding 550°C.
- b. Fire proximity suits (Fig. 1)
Not to enter the flame area.

Notes:

- 1) Never use fire proximity clothing where fire entry suits are required.
- 2) Clothing for protection of close approach and other emergencies is given in Table 1.
- 3) Protection shall be limited to the protection against ALFA @ - RAY (Particle) or BETAB-RAY (Particle) radiation.

Table 1 - Clothing For Protection Against Intense Heat

Type of Hazard	Example Of hazards	Flame Resistance	Suggested Method of Protection	Fitting of suit	Head protection	
					Type	Degree of Ventilation
Radiant heat	Close approach fire	Outer material shall be “Flame Proof” and interlining shall be of low flam inability	High reflective surfaces for high rate of heating thermal	Free ventilation desirable to allow evaporation and prevent	Face shield of wire gage or transparent material which may	Naturally ventilated

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			resistance.	local heating	be reflective coated	
Radiant heat and occasional flame lick	Rescue work and fire fighting operation in proximity of flame	Outer materials and inter lining shall be flame proof	Reflecting surfaces against radiant heat and thermal resistant as high as practicable*	As little entry of air and as much free circulation of air inside the suite	Helmet with visor to drape to enclose the mead and nock visor reflectively coated	Ventilation may be under control of weather but shall be closable
Radiant heat and pockets of flame	//	//	//	Negligible entry of air and much precirculation of air inside the suit	//	//
Radiant heat and complete static immersion	Oil fires fire entry work	Outer material shall be non combustible. Properties, inter lining to be flame proof*	//	//	//	Shall be as air tight as practicable

* With material characteristic
Aramid fiber/Conex (PBI Blended, AEX FIRE)
Pre-carbon fiber / PYRO MEX/ Glass Fiber / ceramic fiber

2. Ordinary clothing can be protected against flame or small sparks by flameproofing.

Flameproofing will make material:

- a. Highly flame-resistant.
- b. An effective water soluble for flameproofing is 226.8 grams of borax and 113.4 grams of boric acid in 3.8L of hot water.
- c. Flame proofed clothing should be marked for distinction.

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Fig. 1 - Aluminum-coated, heat-protective suit is used in fighting fires without entering the burning area. transparent faceshield is metal coated to offer increased heat protection. head fitting includes chin strap



Fig. 2 - Fire entry suit for use in entering a burning area. note the self-contained breathing apparatus

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Fig. 3 - Demonstration of fire-entry suit. spun glass material of suit is chemical resistant and will not burn, even in pure oxygen atmosphere

Materials

The material of any articles of clothing used against heat and fire proximity shall be of flameproof.

Any lining material, which because of the design of the clothing, could come in contact with flame shall be of flameproof material.

Design and Make-Up

There shall be no pockets external to the assembly.

The trousers and the sleeves of the jacket shall not have turn-ups.

Wherever possible seams and sewing threads shall be protected. The threads shall be compatible with the body fabric and shall not impair the effectiveness of the protection afforded by the garment.

Head Wear

1. Helmets intended for use against fire proximity shall be tested complete with visors, there shall be no discoloration. The visor shall show no sign of cracking or breakdown, and all seams shall be substantially undamaged.
2. Helmets required to provide protection against impact and shall pass the test for shock absorption.

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3. The amount of respirable air within the headwear and suit shall be made clear to the purchaser by the manufacturer and should be consistent with the use to which the equipment is to be put and for the time for which it is to be used.
4. Fasteners shall be so designed or protected that they cannot be damaged by heat or cause head injury to the wearer.
5. The field of vision shall meet the requirements of the operations to be conducted by the wearer and shall be agreed between the purchaser and the manufacturer.
6. The headwear shall be designed so that the visor or faceshield does not mist up in use to an extent that reduces the visibility.

The Visor/Face Piece

1. The visor or faceshield shall be constructed of at least two independent layer of material, and their edges shall be effectively protected by suitable frames or by the design of the helmet itself.
2. The degree of transparency to light passing through a visor shall be specified.
3. When the visor or faceshield is sprayed with water, it shall not have no fragment and neither the field of vision of the wearer nor the transparency of the visor or faceshield shall be reduced by more than 50%.
4. The visor of faceshield shall not crack, fracture or become detached from its frame when tested.
5. Acrylic face piece containing lead in equivalent of 3 mm coating thickness, with heat protective film supported outside as giving a wide vision.

Hand Wear

The gloves shall be graded as light duty or heavy duty and shall be designed so that it will not slip off in use but shall be easy to take off.

Foot Wear/Heat Resistant Boots

The trousers leg of the protective suit should fit snugly into or around the boot to prevent the ingress of flame. Outer shell of Heat Resistant boot is of Aluminized Agamid Fabric Lined with felt or leather. The sole is of heat resistant rubber, which meets UL 96.VO Class Requirements. The toe is protected with steel protector for impact and compression.

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Instructions and Marking

1. Instructions

Manufacturer's instructions shall be provided with each suit of protective fire entry and proximity. These shall give information on how the best results may be obtained in use and on the limitations of the clothing, in particular, full information shall be provided concerning the undergarments used in assessing its performance, and it shall be stressed that the protective clothing for proximity and fire entry should be used only by trained personnel.

The instructions shall also give information on the amount of respirable air contained in the suit in terms of "the time for which it can be safely worn".

2. Marking

a. Each separate article of protective clothing and each garment, except visor and faceshield shall be permanently marked with the following:

- The number of accepted standard;
- The warning must be adhered according to manufacturer's instructions;
- The type of heat against which clothing is designed to give protection, "Flame" "Radiation" or both;
- Each protective garment shall bear a permanent label bearing the manufacturer's identification mark and drawing attention to the necessity of consulting the manufacturer's instructions regarding the use of undergarments.

b. Marking of visor and faceshield

Visors and faceshields shall be marked with the following:

- The number of accepted standard;
- The manufacturer's identification mark.

Testing

Flameproof clothing shall be tested in accordance with BS EN 367, BS EN ISO 6942 Appendix B to J and certified to be flameproof for class and types of hazards.

FIRE RESISTANCE BLANKET

Defined as "Glass Fiber for Extinction of Fire".

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Materials

The fire blanket shall be made of woven glass fiber fabric with silicon rubber coating on both sides.

Containers

Fire Blanket shall be packed and stored in a carry bag with handling loops and can be ready for use by its unique quick release system
The Container shall bear the using instruction marked on carrying bag with the Language specified.

Performance Requirements

All the test requirements laid down on BS 7944, BS EN 1869 shall be carried-out and certified by manufacturers.

Sizes

The following sizes should be used:

- a. 1200 mm x 1200 mm
- b. 1800 mm x 1200 mm
- c. 1800 mm x 1800 mm

The Use

Fire blankets can be used for fire extinction in:

- a. Catering establishment
- b. Schools
- c. Hospitals and nursing
- d. Laboratories
- e. Garage and work shops
- f. Boats and caravans
- g. Ships and galleys
- h. Numerous industrial outlets
- i. Extinction of fire on a persons clothing
- j. Restaurants
- k. Flammable liquid cans