

# Center of Excellence (Protech)



**NITRA**  
**Ghaziabad (UP)**

# NITRA

ISO 9001-2008 Certified



**NORTHERN INDIA TEXTILE REASERCH ASSOCIATION (NITRA)**

- **Set up in 1975 – land allotted by Govt. of U.P**
- **Partly funded by Ministry of Textiles, Govt. of India**

# NITRA Clientele- spreading beyond India

Over 600 clients in India

International Clients- Ethiopia,  
Indonesia, Thailand, Sudan  
Bangladesh & Nepal.

NITRA services are availed by  
textile and garment factories,  
international testing labs central  
and state govt. organizations,  
trade bodies, academic  
institutions and non-textile  
sectors as well.



# ACTIVITIES



R & D



Testing



HRD & Consultancy



Conferences/Seminars

# INFRASTRUCTURE



52 Qualified and Experienced Scientists

&

state-of-art facilities



# Yarn Fabric Garment Manufacturing Laboratories



Embroidery Lab



**Q C Laboratories**  
**(ISO/IEC 17025:2005**  
**Accredited)**



# C A D Labs



# **RESEARCH & DEVELOPMENT**

**Completed more than 100 R&D projects.**

## **BROAD AREAS OF RESEARCH:**

- **Product Development**
- **Process Development**
- **Technology Development**
- **Software Development**
- **Need based research**



# Centre of Excellence (Protech)

## Phase1:

With capital grant of Rs 11cr. from Ministry of Textiles, CoE (Protech) established testing facilities in 2009 at NITRA & IIT'D with NITRA as lead partner.

## Phase 2:

NITRA received Rs 9 cr (out of Rs 14 cr sanctioned) to further strengthen its testing facilities and establish incubation center

# Activities

- Product Development
- Preparation of standards/Specifications
- Testing
- Training & workshops/seminars
- International Linkages
- Resource center

# Protective Textiles



## Thrust on

- Heat & Flame Protective Textiles
- Extreme Cold Climate Clothing
- Mechanical Hazard Protection Clothing
- Barrier Fabrics
- Specialty Finish Protective clothing

Products Developed  
By  
CoE (Protech)

# Combat Uniform (Nylon 66 & Cotton 50/50) Antimicrobial Garments



(Cotton & Silver Coated Nylon)

## Protective Clothing for Workers in Pesticide Industry



(Cotton & Crabyon)

# HEAT RESISTANT FABRIC

- DREF yarn having glass filament in core and cotton fibres as sheath were developed.
- Fabrics produced from these yarns are found to have high heat resistance.
- Garments produced from these fabrics are suitable for people working in boiler house & furnace rooms.



# CUT RESISTANT FABRIC

- DREF yarn having metallic core and cotton sheath were developed. Fabrics made from these yarns exhibit cut resistance. These fabrics are used to manufacture seat covers, travel bags etc.
- Presence of cotton on surface of the yarn makes the fabric compatible for surface coating as well as comfortable to use.



# Selection of Disperse Dyes for Automotive Fabric to meet Automobile Manufacturer's Specification



# Instruments Developed



**Standards & Specifications  
prepared by  
CoE (Protech)  
  
for  
BIS & Defence supplies**

# **Formulation of Technical Specifications/Standards (Protech)**

## **Technical Specifications**

**prepared by NITRA**

**for**



**CoBRA**



**Specifications**



**NYCO Uniform**



**Nylon Belt**

**Multi purpose light weight  
load bearing frame  
with carrier facilities and  
convertibility as stretcher**



**Life Jacket**

**Waterproof multipurpose rain  
poncho with convertibility as  
bivouac**





**Specifications**



**Anti-Mosquito Veil**



**Jungle Hat**



**Balaclava with convertible properties as cap comforter, face mask and cold weather muffler**



**Pouches**



**Durable Combat Rucksack**



**Special operation Rope**

# Technical Specifications

prepared by NITRA for



## Indian Navy



**Cap FS Blue**



**T-  
Shirt**



**Short**



**Socks**

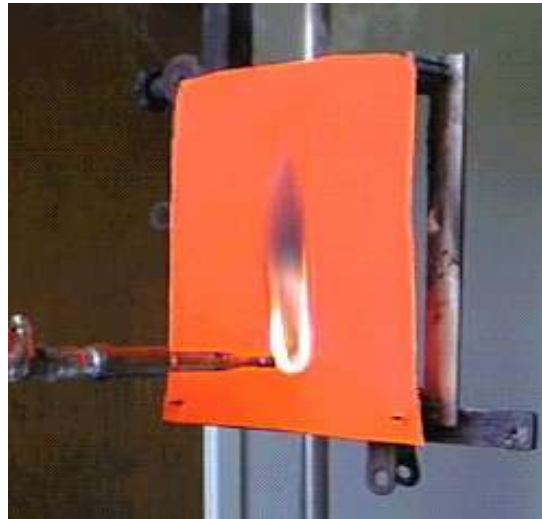
**UNARMED COMBAT DRESS  
FOR MARINE COMMANDOES**

# IS Specifications

## (Revised/Drafted)

- Nylon life jacket with expandable polyethylene foam, buckle and whistle plastic **(Revised & sent for adoption)**
- Disruptive Pattern (Camouflage pattern) cloth for combat uniform made of Nylon 66 and cotton blended material **(Drafted & communicated to BIs)**

# Facilities @ FR Testing Laboratory



## Flammability tester for vertical oriented samples\*



BS EN 13772, BS 5438, BS EN 532, BS EN 15025, BS EN ISO 6940, BS EN 6941, BS EN 1101, BS EN 1102, BS EN 1103

## Limited Oxygen Index Tester



ISO 4589-2  
ASTM 2863

## Inclined Automatic Flammability Tester \*



ASTM D 1230, CFR 16-1610, NFPA 702

## Molten metal splash Tester \*



ISO 9185 : 1990/EN 373

## Vertical Flammability Tester \*



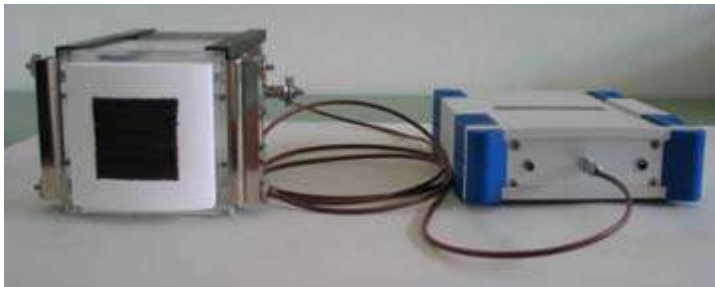
BS 5438, BS 5867, BS 3119



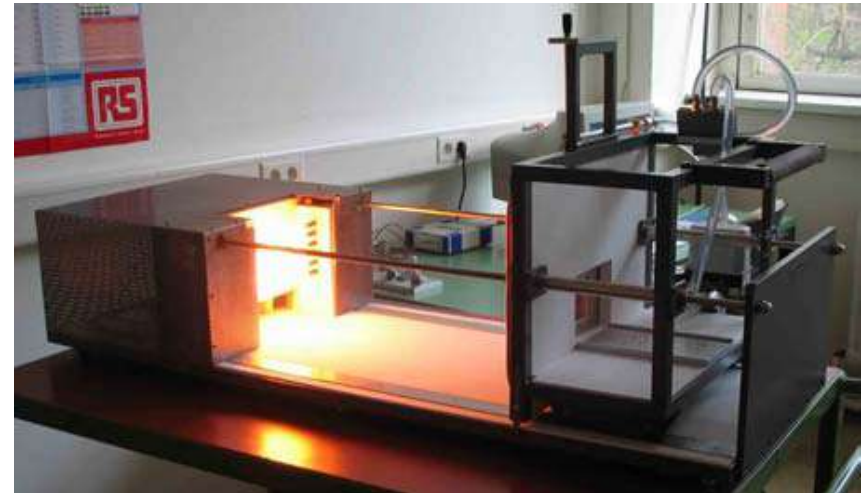
## Horizontal Flammability Tester \*

ASTM D 635/3801/4804/4986/5048,  
ISO 9772.3/3, FMVSS 302, SAE J 369

## Determination of thermal grade of fabrics for heat protective clothing \*



**Calorimeter  
according to EN  
ISO 6942 with USB  
Module.**



**Fixture with a radiation source  
and cooling device**

# Sweating Guarded Hotplate

Thermal Resistance as  
per ISO 11092, ASTM  
F1868

Vapor Permeability as per  
ISO 11092, ASTM F1868



# TPP Test Apparatus \*

**Determination of heat transmission on exposure to heat**

**ISO 9151/EN 367**



**Burner**



**TPP test apparatus**

**Thermal Protective Performance**

## Toxicity Tester



Toxicity Test as per NCD 1409

## Smoke density



UIC 564 Appendix 15

## DSC & TGA



Thermal Analysis of  
Fibres & Polymers

## Moisture Management Tester \*



Absorption rate; One way transportation capability, Spreading/drying rate (ISO/AATCC-Drafting stage)

## Water Vapor Permeability Tester



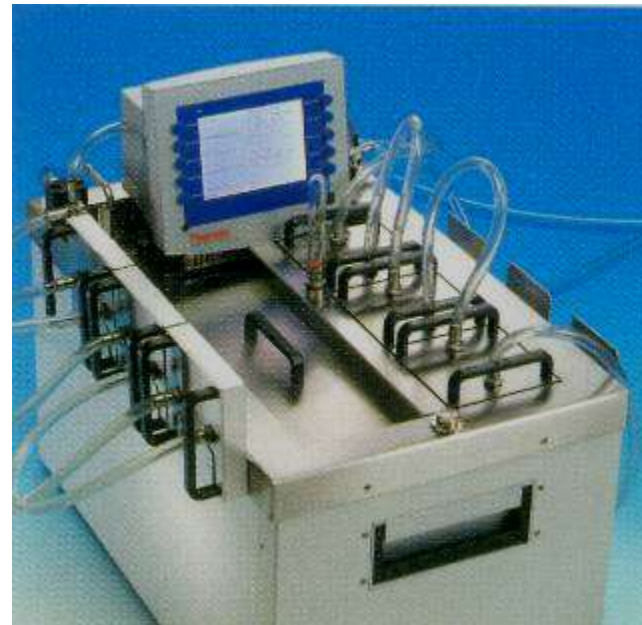
ASTM 96, ISO 2528

## U.V. Analyzer



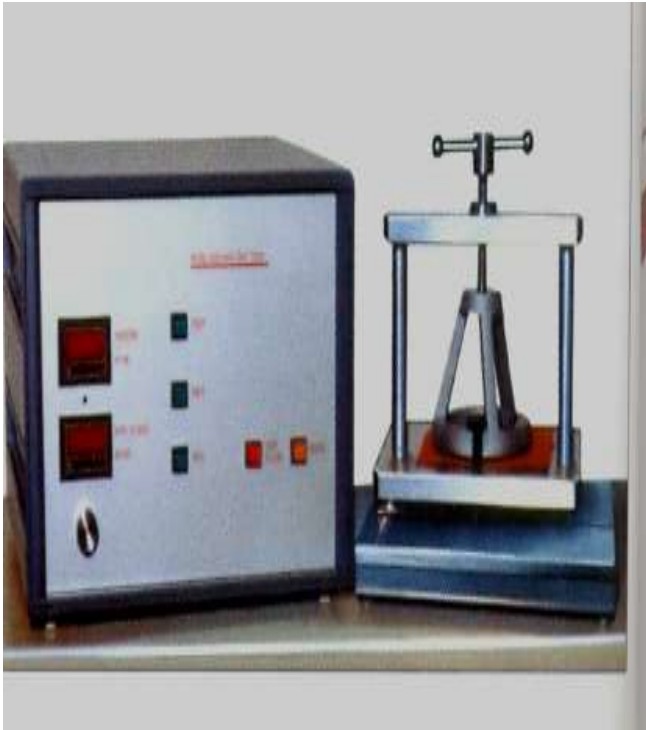
AATCC 183, AS/NZS 4399

## Fogging Tester \*



Society of Automotive Engineers (SAE) J 1756  
DIN 75201, ISO 6452/2000

## Hydrostatic Head Tester \*



AATCC 79/127, BS EN 20811/3321/3424

## Spray Tester-Water Repellency \*



ISO 4920, AATCC 22

# Water Cooled Xenon Tester

Colour Fastness & Weathering Property

AATCC 16, ASTM G151, ASTM G155,  
ASTM D6695, ASTM D6662, ASTM  
D6577, ASTM D6551, ASTM D6083,  
ASTM D5794, ASTM D5071, ISO 105  
B02/B04/B06



# Humidity (RH 0-95%) & Temp. control Chamber



Automotive textiles

# Computer Colour Matching



ISO 105 A02 & A03  
AATCC Test method 173

# Retero reflecto meter

\*



EN 471

## High Capacity UTM



ASTM D5034, ASTM D5035,  
ISO 5081, ASTM D1775,  
ASTM D1424, IS 1969, IS  
6489, ISO 9290, ASTM  
D2261

## Dynamic Impact Tester



ISO 6603, ISO 7765, ASTM D3763,  
ASTM D5628, ASTM D2444, ISO  
179, ISO 180, ISO 8256, ASTM  
D256

## Ball Burst Tester \*

Load and Strain measurement  
as per ISO 10113, ISO 10275,  
EN 10002-1, EN ISO 9513, EN  
ISO 12236



## Taber abrasion Tester



ISO 5470, ASTM 3884

## Abrasion Resistance Tester



Oscillatory Abrasion Resistance  
as per ASTM D4157

## Electronic crock meter \*



ISO 105X12/D02, AATCC 8/165,  
BS 1006 D02

## Rotary crock meter \*



ISO 105X16, AATCC 116

## Martindale Abrasion cum Pilling Tester



ASTM D: 4970

## Snagging Tester



Snagging Resistance  
as per ASTM D3939

## Seam Fatigue Tester\*



Japanese Automotive  
Standard Organization (JASO)  
M 403  
(Suzuki Engineering Standard)  
SES 3208  
Hyundai Engineering Standard  
(HES 6511)  
(General Motor) GMW 3405

## Digital Microscope



Damages on Fibre Surfaces,  
Fabric/Yarn Defect Analysis, Maturity  
as per ASTM D 2480,  
ISO 1833

## Air Permeability Tester



ISO 9237

## Top loading laundering washing & front loading dryer



AATCC 124, 130, 135, 142, 143, 172 & 179

## Uster Unevenness Tester



ASTM D : 1425

## Laser Spot Hairiness Tester



## Vibroskop



ASTM D 1577

## Vibrodyne

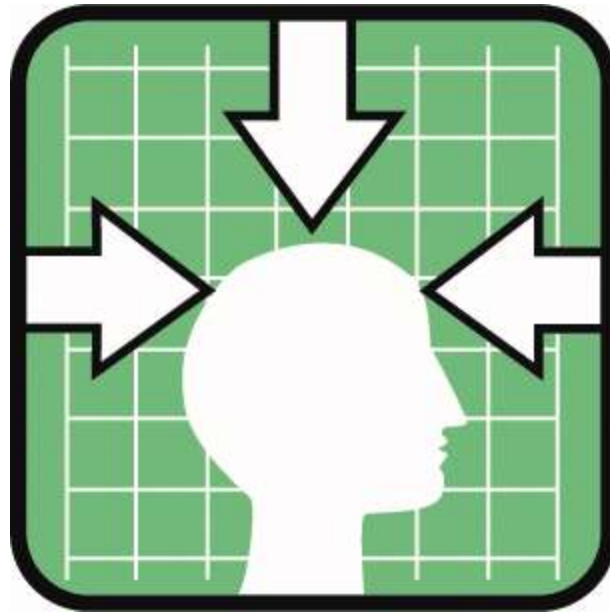


ASTM D:3822

## HVI-900



ASTM 5867



# Skill Development Programs (ISDS)

Category	Textiles	Technical Textiles
1. Operators, Mechanics & Quality Controllers	49	21
2. Supervisors	9	12
3. Working Executives	6	1
<b>Total</b>	<b>64</b>	<b>34<sup>@@</sup></b>

### Trainees' Profile

School Pass-outs (5<sup>th</sup> to 12<sup>th</sup> std.)

ITI, Diploma Holders & Graduates

Working Executives

### Training Locations

- NITRA & 7 PLSCs'
- On-site (At Factories)
- Polytechnics /colleges/Universities

**@@ For ITI/Diploma/degree students programs will be conducted during vacation in sandwich mode**



# **Formulation of Regulations in respect of Protective Textiles (Heat & Flame)**

**Draft White Paper**

# Occupational Environments

## Environments

- Iron and Steel foundries
- Nonferrous foundries
- Boiler rooms
- Ceramic, Glass, Rubber & Chemical plants
- Brick-firing
- Electrical utilities
- Mining sites
- Laundries
- Commercial kitchens
- Confectioneries
- Bakeries.



# Foundry work-wear

- Foundry work is very hot, noisy & potentially dangerous environment.
- If exposed regularly – may cause **Deafness, lung cancer and respiratory problems.**
- It is important that workers are provided with properly designed and guarded personal protective equipment.





associated with Foundry

## Heat

The furnaces and molten metal create a hot working environment resulting in -

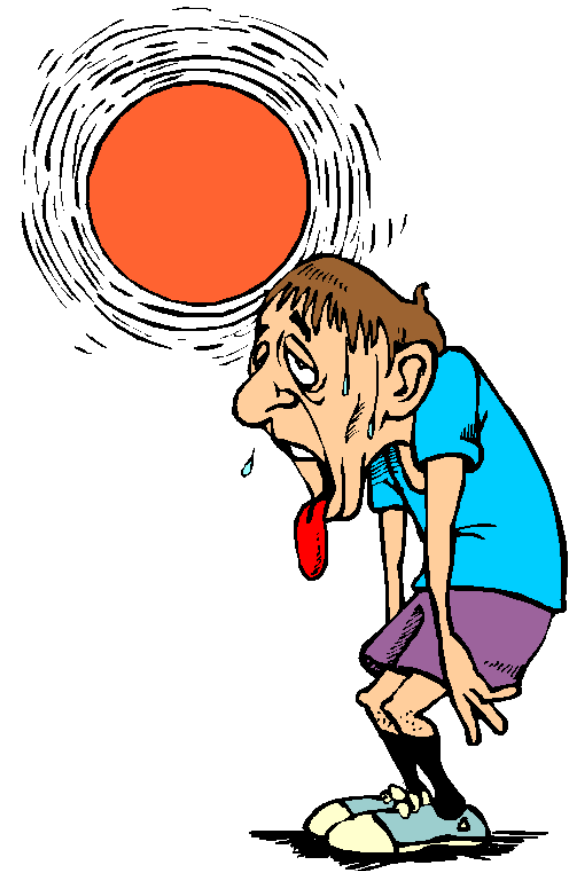
Dehydration, heat cramps, heat exhaustion and heat stroke

May also develop **eye cataracts** from IR & UV radiation which emit when pouring white hot metal

## Molten metal

may come into contact with metal splashes and electromagnetic radiation.

Splashes, sparks, radiant heat and radiation from molten metal can result in serious burns and eye damage.



# Work-wear in India

**By God's will, it's all fine**



**Barefoot, shirtless....**

**As metal pours into ladles, sparks fly, sometimes igniting workers' clothing. Plant officials say accidents do not occur**



**Flames, sweat and liquid iron mixing in the smoke....**



**A foundry worker cooling off.**

# Work-wear in India



**IS 15748:2007**

**Textiles – Protective clothing for industrial workers exposed to heat (excluding firefighters' & welders' clothing)**

**Regulations...  
There are none!!!**

# Study of Indian Industrial Laws

- There are 64 industrial laws dealing with industries and industrial workers.
- These legislations are mainly central legislations dealing with labor force.
- They discuss about the industries and safety measures such as use of helmets, gloves, goggles, shoes, safe drinking water etc.

**However, none discuss about safety work wear...**



# Legislations in which general safety & health is made compulsory

1. **Boilers Act, 1923**
2. **Factories Act, 1948**
3. **Contract Labour (Regulation and Abolition) Act, 1970**
4. **Dangerous Machines (Regulation) Act, 1983**
5. **Dock Workers (Safety, Health and Welfare) Act, 1986**
6. **Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996**
7. **Fatal Accidents Act, 1855**
8. **Iron Ore Mines, Manganese Ore Mines and Chrome Ore Mines Labour Welfare Cess Act, 1976**
9. **Limestone and Dolomite Mines Labour Welfare Fund Act, 1972**
10. **Mines Act, 1952**
11. **Plantation Labour Act, 1951**
12. **Mines and Minerals (Development & Regulation) Act, 1957**

13. **Manufacture, Storage and Impose of Hazardous Chemicals Rules, 1989**
14. **Biomedical Waste (Management & Handling) Rules, 1998**
15. **Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996**

### **Legislation in which safety & health is not specifically made**

**16. Industrial Employment (Standing Orders) Act, 1946.**

As per this act the employers are required to strictly adhere to the principles laid down in the Act. It has a direct relationship with the terms and conditions of service of employees.

# What does the Factories Act 1948 say on PPE ?

Section 35      Protection of Eyes

Section 36      Precautions against dangerous fumes, gases, etc.

Section 36A     Precautions Regarding the use of portable electric light

Section 37      Explosive or Inflammable Dust, Gas, Etc.

# Suggested Amendment in Factories Act, 1948

Two New Sections will be inserted :-

- a) In Section 2, Safety work wear may be defined.
- b) A new Section 15A may be added to provide as under:

“The technical person who is expected to attend to and operate the heating equipment, high voltage electrical installation or furnace in normal course of time or any one who is required to attend to and operate the heating equipment, high voltage electrical installation or furnace shall wear safety work wear while attending to such duties and such safety work wear shall be provided by the employer of the heating equipment, high voltage electrical installation or furnace to such operator.

**The employer shall ensure to display sign boards in the immediate vicinity of the heating equipment, high voltage electrical installation or furnace persuading such attendants to wear safety work wear.**

**Such safety work wear shall be replaced with a new one by the employer at free of cost if and when the work wear does not fulfill minimum safety standards.**

**In every place where fifty or more building construction workers are employed, the contractor shall provide free of cost safety work wear to such building workers. In case the building is constructed by the owner, then the employer shall provide such safety work wear. Safety work wear shall commensurate with the nature of work undertaken by the building workers.**

**In every place where contract labour is engaged exceeding twenty persons, the contractor shall provide free of cost safety work wear to such contract labourers.**

**In every place where dangerous machine is engaged, the contractor shall provide free of cost safety work wear to such persons operating dangerous machines.**

**In every dock, the contractor shall provide free of cost safety work wear to such persons operating in the dock. This regulation is mandatory depending on the nature of work carried out by the worker.”**

***Provided further that such safety work wear should meet the requirement of ISO 11612 and BS EN 61482-1-2.***

***Provided further that such safety work wear should meet the requirement of ISO 11611 in case the worker is handling welding equipment.***

# Safety work wear - Defined

Safety work wear means and include protective personal clothing to protect human body from heat, dust, fire and resultant natural and manmade disasters that cannot be controlled easily and in the event of such natural and manmade disasters affecting human being would result in fatal accident including death.

Such safety work wear shall be manufactured, tested, marketed and used after thorough laboratory testing.

The administrative ministry shall cause to issue appropriate notification in the gazette as to laboratory that can test such safety work wear including fixing up of standards in accordance with technical regulations.

## Present status of IS and ISO/BS EN standards

S.No.	ISO/BN EN Standard	IS standard	Remark
1	<b>ISO 11611 : Protective clothing for use in welding and allied process</b>	<b>IS standard not available</b>	<b>-</b>
2	<b>ISO 11612: 2008 Clothing for protection against heat and fire-Test methods and performance requirements for heat-protective clothing</b>	<b>IS 15748: 2007, Textiles- Protective clothing for industrial workers exposed to heat (excluding firefighters' and welders' clothing)</b>	<b>ISO 11612: 2008 includes ISO 15025 Procedure B and ISO 121127 test methods but IS 15748: 2008 does not include these methods.</b>

S.No.	ISO/BN EN Standard	IS standard	Remark
3	ISO 14116: 2008 Protective clothing-Protection against heat and flame-Limited flame spread materials, material assemblies and clothing	IS 15742: 2007 Requirements for clothing made of limited flame spread materials and material assemblies affording protection against heat and flame specification	-
4	BS EN 61482-1-2: 2007 (Test Method)-Live working-Protective clothing against the thermal hazard of an electric arc tester and accessories	IS standard not available	IS 15405 Live working-Flame resistance materials for thermal protection of worker-Thermal Hazards of an Electric Arc-Part-1: Test method based on IEC 61482-1: 2002

Thank You