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खंड 27 अंक 5 एवं 6 अगस्त-सितम्बर 2013 आईएसएसएन 0970-2628

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उपभोक्ता मामले, खाद्य एवं
सार्वजनिक वितरण राज्य मंत्री
(स्वतंत्र प्रभार)

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श्री सुनील सोनी (आई.ए.एस.)

अपर महानिदेशक

श्रीमती अल्का पंडा, (आई.ए.एस.)

मुख्य सतर्कता अधिकारी

श्री अलोक शर्मा (आई.पी.ओ.एस.)

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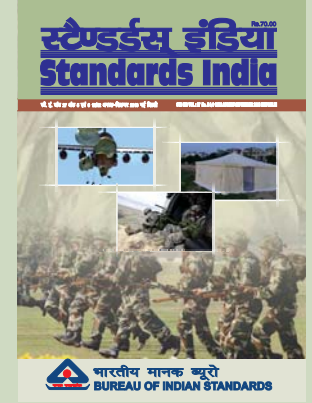
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डा (श्रीमती) स्नेह भाटला, उपमहानिदेशक (अध्यक्षा)
श्री अनिल जैन, वैज्ञानिक एफ एवं प्रमुख (पी एण्ड सी)
श्री ए के बंसल, निदेशक (मुद्रण)
श्रीमती रोमा राय, निदेशक (पुस्तकालय सेवाएँ)
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9, बहादुर शाह जफर मार्ग
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दूरभाष : 23237995
23230131
23233375
23239402 Ext. 4317

ग्राम : 'मानक संस्था'

फैक्स : +91-11-23 23 50 69
+91-11-23 22 15 35

ई-मेल : pub@bis.org.in
info@bis.org.in

इंटरनेट : http://www.bis.org.in

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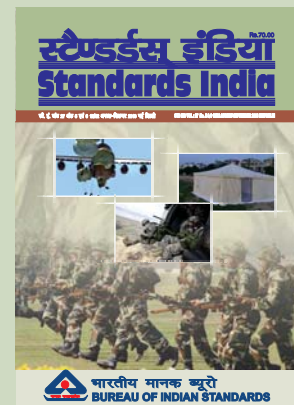
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COVER – In the modern era of cutting age technology, textiles have gone beyond conventional applications and are today used by even the defence sector as tools of protection in air, water and land as well as in various other areas. (see page 2)

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All communications should be addressed to:

THE EDITOR, STANDARDS INDIA
BUREAU OF INDIAN STANDARDS
MANAK BHAVAN
9, BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002 INDIA

Phones : 23237995
23230131
23233375
23239402 } Ext. 4317

Grams : 'Manaksanstha'

Fax : +91-11-23 23 50 69
+91-11-23 22 15 35

E-mail : pub@bis.org.in
info@bis.org.in

Internet : http://www.bis.org.in

Defence Textiles: Present Scenario and Future Challenges

Dr Anurag Srivastava
Defence Material and Stores
Research and Development
Establishment
(DMSRDE), Kanpur

The approach of war in the twenty first century will be directed towards quick deployment of sophisticated and lethal forces made of lean army units. This will expose our military personnel to a range of adverse conditions in terms of physical threats, battlefield conditions and physiological stresses.

Polymers and textiles, independently and in combination, provide enormous opportunities towards novel applications. Besides development in process techniques in every sphere of textile manufacturing, the advent of new fibres, engineered yarns, polymeric coatings, low add-on finishing additives, has immensely benefited the technical and functional textiles. The primary focus of Defence textiles is on high technical performance and functional properties rather than their aesthetic or decorative characteristics. The end-uses are highly diversified and include aerospace, industrial, marine, military, safety, medical and geo-textiles. Applications are found in inflatable structures such as airships, lifeboats and tents; reinforcement in composites for construction, body armour and vehicle protection; in filters, as a base for flexible printed circuits; hose and conveyor belts, tyres, and so on. Depending on their specific expected functions, these fabrics are produced in woven, knitted and non-woven forms. The range of textile materials used in defence is highly diversified, for example, climate protective clothing, Nuclear, Biological and Chemical (NBC) protective fabrics, bullet proof composite panels, camouflage fabrics, inflatable boats, protective covers and so on to name a few. The military fabrics not only demand the protective capability but also very high order of performance in war fields. The technical textiles falling in these categories are

described by terms such as Intelligent Textiles, Interactive Textiles, Smart Textiles depending on their special performance-focus. A soldier needs to be protected from threats such as ballistic; detection/surveillance devices used by adversary; mines laid by retreating force; Nuclear/Biological/Chemical attacks; climatic, flame hazard etc. The present jackets and trousers for glacier are made of downs filled in cotton with a synthetic outer water proof Poly-urethane (PU) coated nylon fabric. Many items of glacier clothing are successfully indigenized. For insulation up to -20°C, DMSRDE has developed trousers and jackets on multilayer system incorporating acrylic pile fabric (innermost layer), hollow fibre of polyester based insulating materials and PU coated fabrics (outer layer). NBC protective clothing has been developed on multilayer principle and introduced in the services. The inner protective layer of NBC suit is developed from activated carbon spheres prepared from phenolic precursors which are adhered on polyester and viscose blended fabric and the coated side is laminated with non-woven dot-printed fabric. DMSRDE has made significant advances in the field of polymer composite based materials for a wide range of end-uses such as combat helmet, soft and hard body armor (bulletproof jacket), blast protective suit and anti-mine boots in order to provide complete ballistic protection to soldiers. In the area of camouflage, DMSRDE has developed a wide range of fabrics with interwoven metallised yarns, coated with Poly Vinyl Chloride (PVC) pigment formulations which in a specific format of scrim have enormous potential for providing camouflage. Various tent fabrics with camouflage printing has been developed and introduced into services.

Ideally, the soldier needs to be equipped with a system that provides him simultaneous protection from all potential threats. In armed forces, the technical textiles are for protection of soldiers from enemy, extreme weather conditions and for protecting military equipments. Thus the fabric should be such that the enemy is not able to detect the soldier visually or by advance electronic devices. The fabric should be bullet proof and fire resistant. In the extreme cold region the clothing should be able to protect them from temperature as low as - 40°C coupled with high wind velocity and in the deserts as high as +50°C and besides that they should remain comfortable and lighter in weight. They need protection from high level of Ultra-violet (UV) rays and rain in those regions. The tents and covers require special fabrics as the military equipments are highly sensitive to heat, moisture and light. The next generation protective clothing should have in-built sensors, which can monitor vital signs of wearer and should even be capable of actuating automatic drug-delivery system when necessary. Wearable electronics should be an integral part of the clothing. The wearable computers should have Global Positioning System (GPS) and two-way safe communication systems.

With the advances in polymeric science and process technologies, synthetic fibres have made inroads into textile consumption as an alternate to conventional natural fibres in a big way. And as the technologies in various disciplines of engineering advanced, the textile manufacturing processes have brought in high level of automation. Today the contribution of textile industry to national economy is 4 percent of GDP, 14 percent of total industrial production, 17 percent of export earnings with employment to over 35 million people. In terms of USD, the size of industry is 50 billion out of

which 30 billion is from domestic consumption and 20 billion is through exports. Emergence of social change-agents like increasing retail penetration, swelling wardrobes of middle class, higher disposable income level, growth of double income nuclear families, increased usage of credit cards (focus being shifted from product price to equated monthly installments) and such factors may expand this size to 120 billion by the end of the Eleventh five year plan, that too if we consider only past trends as indicator and extrapolate. The post WTO scenario presents many challenges but at the same time also offers enough opportunities for growth of Indian textile industry.

India has a large pool of skilled and scientific/technical manpower which can play a major role in shaping the future of industrial face of this country. As the country is transforming into a developed nation, considerable emphasis is being laid down on developing new technologies as well as on addressing concerns such as intellectual property, quality standards and environmental issues. The progress in discovery driven research, advances in existing technologies and surfacing of emerging technologies offer enormous potential in shaping the future of functional textiles. The market for those textiles is very positive and poised for a stupendous growth. The relevant statistics for market present attractive growth potential and foreign direct investment in this area. Development of new materials and technologies would lead to the creation of new applications and open up new markets, which are bound to enlarge the market size and offer opportunities for further growth.

The big question is how the new technologies will be developed and how the emerging technologies will be exploited in order to cater for the future challenges. The role of textiles, from being a primary need of human

being, now encompasses a variety of specific needs. To satisfy growing expectations of a wide spectrum of consumers, the focus has to be on hi-tech, high value and high volume functional textile products. A glimpse of innovative materials, emerging technologies and potential applications is presented in succeeding paragraphs to indicate what we have in store for future in the domain of functional textiles and what possibilities exist for the road ahead.

INNOVATIVE MATERIALS

Advances in material science offer innovative materials for futuristic textiles. Few such materials of interest to textiles are briefly summarized below.

Phase Change Materials

A normal textile material absorbs about one kilojoule per kilogram of heat while its temperature rises by one degree Celsius. Every material absorbs heat during heating process while its temperature rises constantly. The heat stored in the material is released into the environment through a reverse cooling process. During the cooling process, the material temperature decreases continuously. Comparing the heat absorption during the melting process of a phase change material (PCM) with those in a normal heating process, a much higher amount of heat is absorbed if a PCM melts. A paraffin-PCM, for example, absorbs approximately 200 kilojoules per kilogram of heat if it undergoes a melting process. In order for a textile to absorb the same amount of heat, its temperature would need to be raised by 200 K. The high amount of heat absorbed by the paraffin in the melting process is released into the surrounding area in a cooling process starting at the PCM's crystallisation temperature. After comparing the heat storage capacities of textiles and PCM, it is obvious that by applying paraffin-PCM to textiles, their heat storage

capacities can be substantially enhanced. In order to prevent the paraffin's dissolution while in the liquid state, it is enclosed into small plastic spheres with diameters of only a few micrometers. These microscopic spheres containing PCM are called PCM-microcapsules. The microencapsulated paraffin is either permanently locked in acrylic fibres, polyurethane foams or coated onto the surface of a textile structure. Active wear needs to provide a thermal balance between the heat generated by the body while engaging in a sport and the heat released into the environment. The heat generated by the body during strenuous activity is often not released into the environment thus resulting in thermal stress. On the other hand, during periods of rest between activities, less heat is generated by the human body which can cause hypothermia. A suitable thermoregulating effect according to the prevailing wearing conditions can only be realised when specific design principles are applied in the development process of such active wear-garments. It is necessary, for example, to match the PCM quantity applied to the active-wear garment with the level of activity and the duration of the garment use. The substrate with incorporated PCM-microcapsules needs to be integrated into a suitable location of the garment design.

Stimuli sensitive materials

Recent progress in the field of stimuli-sensitive polymers (SSP) gives optimism that fibres can be made, which self-regulate structure and performance in response to environmental variation. Fibres from SSP that respond to changes such as pH, temperature, and electrolyte are being developed using techniques involving wet-spinning of cross-linked gels made from SSP, coating existing fibres with cross-linked SSP using high intensity UV curing techniques

and grafting SSP to existing fibres using gamma radiation. High rate formation of SSP gels has been successfully demonstrated for gels that respond to both low and high pH changes and the mechanism for temperature sensitive gels is assured. Typical results illustrate the dramatic change in swelling produced by pH changes in polypropylene fabric grafted with PAA at 220 percent add-on. One approach is to create textiles having fibers with conventional textile properties, but with surfaces coated with SSP. Another approach is extrusion of fibers formed entirely of SSP or with SSP as a coating. Chitosan fibers are being spun from aqueous acetic acid into a coagulation bath of aqueous sodium hydroxide. Optimum coagulation conditions have been determined by studying the boundary motion of chitosan solution in contact with the coagulant. These materials offer great potential for applications such as controlled-delivery for functional substances (drugs, nutrients, herbicides, etc.) temperature and moisture regulation, separation, communication, sensors, robotic muscles, and nano and micro devices.

Shape Memory Materials

Shape memory materials (SMP) are those materials that can change from a temporary deformed shape back to an original shape. SMP are finding an increasing use in such areas as clothing where they respond dynamically to changes in heat and moisture levels, ensuring greater comfort for the wearer. The scientists are working on methods for synthesizing, characterizing and modeling shape memory materials. This technology has been extensively pioneered by the UK Defense Clothing and Textiles Agency. When these shape memory materials are activated in garments, the air gaps between adjacent layers of clothing are increased, in order to give better insulation. The incorporation of shape

memory materials into garments thus confers greater versatility in the protection against extreme heat or cold. A shape memory alloy is usually in the shape of a spring. The spring is flat below the activation temperature but becomes extended above it. By incorporating these alloys between the layers of a garment, the gap between the layers can be substantially increased above the activation temperature. In consequence, considerably improved protection against external heat is provided. Shape memory alloys, such as nickel-titanium, have been developed to provide increased protection against sources of heat, even extreme heat. The temperature of activation can be chosen by altering the ratio of nickel to titanium in the alloy. Cuprous-zinc alloys are capable of a two-way activation and therefore can produce the reversible variation needed for protection from changeable weather conditions. They will also react to temperature changes brought about by variations in physical activity levels. Shape Memory Polymers have the same effect as the Ni-Ti alloy but, being polymers, they will potentially be more compatible with textiles. For clothing applications, the desirable temperatures for the shape memory effect to be triggered will be near body temperature. Bi-Material Film Laminates rely on differing coefficients of thermal expansion to produce a reversible bending effect in the same manner as a bi-metallic strip. This temperature dependant bending movement can be harnessed to provide the reversible fabric separation required for variable insulation. A dimensional change of at least 3 percent is required in the film laminate materials and special joining techniques are needed to avoid delamination problems. Polyurethane films have been made which can be incorporated between adjacent layers of clothing. When the temperature of the outer layer of

clothing has fallen sufficiently, the polyurethane film responds so that the air gap between the layers of clothing becomes broader. This broadening is achieved if, on cooling, the film develops an out-of-plane deformation, which must be strong enough to resist the weight of the clothing and the forces induced by the movements of the wearer. The deformation must be capable of reversal if the outer layer of clothing subsequently becomes warmer.

Chromic Materials

These are textile materials which change their colour reversibly according to external environmental conditions, for this reason they are also called chameleon fibres. Chromic materials are the general term referring to materials which radiate the colour, erase the colour or just change it because its induction is caused by the external stimuli. Chromic materials can be classified depending on the stimuli affecting them as *Photochromic* where external stimuli is light; *Thermo-chromic*, where external stimuli is heat; *Electrochromic*, where external stimuli is electricity; *Piezochromic*, where external stimuli is pressure; *Solvatechromic*, where external stimuli is liquid and; *Carsolchromic*, where external energy is electron beam. To date, photochromism is most important for optical switching data and imaging systems, rather than in textile applications. Photochromic fibres are further categorized into those which emit the colour when activated by the visible light and those fibres which emit the colour when activated by ultraviolet radiation. There are fibres which emit fluorescent colour, for example red, green or blue under ultraviolet radiation in a dark place, though they maintain their original colour when exposed to natural light. The inorganic fluorescent paints used for this purpose are mixed at an approximate rate of 10 percent in the liquid during

the spinning operation. Two types of thermochromic systems that have been used successfully in textiles are : the liquid crystal type and the molecular rearrangement type. In both cases, the dyes are entrapped in microcapsules, applied to garment fabric like a pigment in a resin binder. The most important types of liquid crystal for thermo-chromic systems are the so-called cholesteric types, where adjacent molecules are arranged so that they form helices. Thermochromism results from the selective reflection of light by the liquid crystal. The wavelength of the light reflected is governed by the refractive index of the liquid crystal and by the pitch of the helical arrangement of its molecules. The most common types of dye which exhibit thermochromism through molecular rearrangement are the spiro-lactones, although other types have also been identified. However, although thermochromism through molecular rearrangement in dyes has aroused a degree of commercial interest, the overall mechanism underlying the changes in colour is still very much open to speculation and further research.

Conductive Materials

Conductive fabrics combine the latest high wicking finishes with high metallic content in textiles that still retain the comfort required for clothing. With the addition of nickel, copper and silver coatings of varying thickness, these fibres provide a versatile combination of physical and electrical properties for a variety of demanding applications. Another type of fibre included in this group is carbon fibres. They are lightweight, durable, flexible and cost competitive and they are able to be crimped and soldered and subjected to textile processing without any problem. These materials also offer designers new opportunities in developing contoured and portable products for both existing and emerging product

markets. The ability to dispense with fixed casings, rigid mountings and inflexible substrates facilitates new radical possibilities in flexible, user-friendly interfacing. Exploration of human/machine interaction and wholly new types of interface sensor technology has resulted in the development of sensory fabric. Today's switching and sensing technologies are basically rigid or semi-rigid. This results in extensive limitations on their applications and new product design becomes constrained by their physical inflexibility. By designing new fabric structures that include conductive fibres, it is possible to realise lightweight switching and sensing technology which can conform to 3-D shapes, is durable, cost effective, washable, wearable, and above all, desirable. There are other applications for conductive materials such as heated clothes for extreme winter conditions or heated diving suits to resist very cold water. In these cases a heat or energy source is needed as the conductive material is not able to generate energy, it is only capable of conduction, to distribute the heat throughout the entire garment or suit.

EMERGING TECHNOLOGIES

Emerging technologies, as briefly described below, present great potential in creating futuristic textiles.

Nano-technology

There is a big future for small science that is textiles based on nano-technology. Nanotechnology is the engineering of systems and materials at the molecular scale. By manipulating materials at such a microscopic scale, scientists are able to make materials that have far more desirable properties than the original, unmodified materials would have had. Nanotechnology is increasingly being used in the field of textiles, to produce fabrics with superior properties as well as textiles and apparel that are smart and intelligent.

The technology focuses on developing a new generation of textile fibers with enhanced functionality for a wide range of applications. The present research is aimed at three primary areas. First area is the nanofiber production that is how different fiber types can be produced using electrospinning techniques in addition to production of nanoparticles of metals and metal oxides and feasibility of incorporating the same into fibres and non-woven and coating them with suitable binders onto fabric surfaces. Second thrust area is the production and properties of specialised carbon nanotubes and nanocomposites. The third area, maturing commercially to some extent now, is exploring ways of using nanofinishes to improve functional properties of fabrics by modifying textile surfaces, including the use of coatings and films for various applications.

Biomimetics

Biomimetic textiles are those that take ideas from nature and implement them in new fibres and fabrics, philosophically solving engineering problems with the help of nature's wisdom. Biomimetics are increasingly being applied to new textile technologies. The research is on to

explain how biologically inspired technologies can meet the needs of industry for cutting edge textile designs and products. Research areas encompass biomimetic principles, the production of biomimetic textiles from proteins and how textile processing methods can adopt biomimetic principles. Modern computer-controlled fabrication methods for producing technical textiles and for structuring the embedding matrix of compound materials render unique possibilities for transferring the complex structures found in plants, which often are optimized on several hierarchical levels, into technical applications.

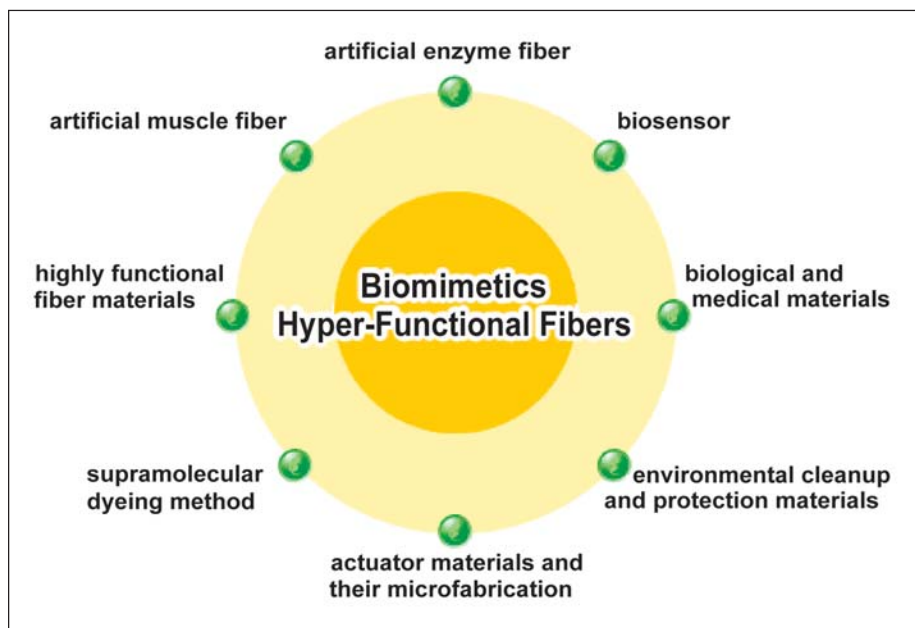
Embedded electronics

Integrating electronics into clothing is a major new concept, which opens up a whole array of multi-functional, wearable electro-textiles for sensing/monitoring body functions, delivering communication facilities, data transfer, individual environment control, and many other applications. The possibilities offered by wearable technologies are tremendous and widespread. The materials and devices being explored in this field include electro-statically generated nanofibres, electroceramic fibres and composites and electroactive fabrics.

It focuses on development in electrically conductive fabric structures and topics related to wearable photonics such as fibre optic sensors, flexible photonic display technologies, communication apparel and optical fabric displays together with integrated structures and system architectures. Optical fibres and LEDs are already well established in the fields of optoelectronics and telecommunications, but few people realize that the technology is now being applied in the textile industry to striking effect. Scientists have now learnt how to 'knit' optical fibres and integrate them with textiles as well as manufacture flexible LED arrays and light-emitting fabrics. The result is a new breed of photonic clothing that not only looks good but also has applications in garments with enhanced visibility and dynamic signals for pedestrians and cyclists. Although the flexible thread-like characteristics of optical fibre may give it the impression of being an easy material to weave, knit or stitch into fabrics, in practice the fibres have proved far more difficult to handle than normal threads. The task is complicated further by the need to connect the fibres to a light source, supply electrical power and ensure that the ensemble can be washed. That said, several companies and institutions now seem to be making good progress and are on the verge of making photonic textiles a commercial reality.

Composites forming technologies

Composites are versatile engineered materials composed of two or more constituent materials which, when reinforced with fibrous materials, lead to improved properties over the individual components whilst remaining separate on a macroscopic level. Due to their versatility, composite materials are used in a variety of areas ranging from healthcare and civil engineering to spacecraft technology. The subject



dives into forming technologies for various composite material forms including thermoset and thermoplastic prepreg, moulding compounds and composite/metal (hybrid) laminates besides forming mechanisms and characterisation for composites, as well as covers simulation and modelling techniques. Three-dimensional (3-D) textile fabrics, which have a system or systems in all the three axes of plane, hold a promising future. The demand for these types of fabrics is expected to increase, especially in the area of high performance composites in housing, automobile industry, construction and reinforcement materials. However, the reduction in the cost of manufacturing and raw materials has to be brought about in order to make these goods competitive in the current and future markets. In this context nonwovens, which are a major constituent of this class of textiles are becoming important because of their ease of manufacture and low production cost.

Computer Aided Manufacturing Systems

Computer numerical control (CNC)-automated machines can repeat processes with accuracy and reliability, and are easily re-programmed when changes to design or production run are needed. Apparel production is a complex process often involving an international supply chain which must respond rapidly to the changing needs and tastes of consumers. The developments in manufacturing technology are aimed at achieving speed, flexibility and productivity of the industry. Key issues being addressed are modelling fabric and garment drape, computer-aided colour matching, yarn design and pattern making, sizing and fit, the role of 3-D body scanning in improving garment fit and design in addition to advances in knitting, sewing, printing, finishing and fabric inspection. Computer-aided

manufacturing involves the use of CNC machines for printing, cutting, joining and many other textiles processes.

POTENTIAL APPLICATIONS

The focus of materials development and incorporating the benefits of emerging technologies will be guided by applications. Few challenging applications for futuristic textiles are listed below.

Military textiles

Textiles for military uniforms face a complex set of challenges. They must provide protection, durability and comfort in a wide range of varying climatic conditions and war threats. The recent research is targeted on how military clothing can best meet the diversified needs of soldiers forced to operate in extremely hostile environment. The issues such as damage and stab resistance, comfort, sweat management, climatic and ballistic protection, safeguarding from weapons of mass destruction and the integration of high-tech gadgetry into uniforms are being investigated.

Medical textiles

Medical textiles remain one of the most dynamic areas of research in textiles. These materials include textile-based biomaterials, hygienic textiles, barrier materials, bandaging and pressure garments for managing chronic infections. The role of textiles in the management of burns and wounds, fibre-based implantable devices such as tissue scaffolds and sutures is being explored widely.

Geosynthetics

Geosynthetics are man-made polymer-based materials which facilitate cost effective building, environmental, transportation and other construction projects. Given their versatility, geosynthetics have promising applications such as filters, separators, landfills, barriers and

foundation materials. These are fabrics which, when used with soil, have the ability to separate, filter, reinforce, protect or drain. Each configuration, for example, geonets, geogrids and others can yield many benefits in geotechnical and environmental engineering design. Geo-textiles are currently used to advantage in many civil engineering applications including roads, airfields, railroads, embankments, retaining structures, reservoirs, canals, dams, bank protection and coastal engineering.

Sport Textiles

The physiological comfort of sportswear can affect not only a wearer's wellbeing but also his performance. The technical developments in the sports clothing industry have resulted in the use of engineered textiles for highly specialised performances in different sports. With high-functional and smart materials providing such a strong focus, companies are increasingly looking for 'value added' textiles and functional design in sportswear as well as intelligent textiles which monitor performance with in-built sensors. Combining clothing functions with wear comfort is a growing market trend, and for all active sportsmen this constitutes one of the vital factors for achieving high level of performance. Innovative fibres and fabrics, smart and intelligent textiles and coated and laminated textiles provide exciting opportunities to enhance comfort in sportswear.

THE ROAD AHEAD

In the years to come, clothing products will increasingly assume smart functions. Clothing will combine the functions of medium, carrier and interface for an extremely wide range of micro system applications. This new generation of "intelligent clothing" places considerable new demands on innovative ability within the clothing

industry. Those demands also offer new potential for future business sectors. A particularly interesting objective is clothing which represents the ideal interface medium between humans and their environment. Everyone wears clothes in several layers one above the other in all day-to-day situations, which means that it is possible to accommodate micro system components comparatively simply and comfortably. The objective should now be to focus on integrating microchip and computer systems as invisibly as possible into clothing, thus connecting

man as unobtrusively as possible with his environment and equipping him as a communication medium. This is a field of innovation and a future potential of fascinating proportions which also opens up interesting possibilities in commercial terms. Clothing as a carrier medium is thus developing into a high-tech product, which will substantially enhance its status. Such clothing should put people in the position to communicate with other people and computer systems as they wish, regardless of where they are, to access global information, for

example, via the internet, and to control any activities remotely. This will make it easier to carry out routine tasks and will demonstrate new ways of working, with the emphasis in both cases on simplifying existing applications and opening up completely new fields of application.

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Dr Anurag Srivastava

B.Tech (Textile Technology) from Government Central Textile Institute (GCTI), Kanpur in 1979; M B A (Marketing) in 1994; Ph.D in Business Administration (Technology Management) in 2004 from Lucknow University, Dr Anurag Srivastava has about 34 years of experience of widely diversified nature in reputed textile industries of Calcutta and Bombay and Northern India Textile Research Association. Presently he is working as Joint Director and Head of Textile Division at Defence Materials and Stores Research and Development Establishment (DMSRDE), Kanpur in Defence Research and Development Organization (DRDO), under Ministry of Defence since July 1988.

He has made outstanding contributions in the field of protection from Nuclear, Biological and Chemical warfare. His quest for development of new generation textile materials, manufacturing processes and coating technologies has led to development of the state of the art textile systems for Defence. First time in the world, a process for making multi-functional fibres in

different colours without using any chemical dyes is developed under his guidance and patented. His contributions in utilizing nano-technology through high-end fibrous assembly are getting global recognition. Dr Srivastava has demonstrated excellent understanding of techno-managerial practices and performed a key-role in technology transfer, bulk-production and quality assurance processes. Under his leadership, new initiatives have been launched in emerging areas of textile research and production lines have been set up in industry for commercial production of advance textile protective systems. He has a number of published research papers and patent to his credit. He has widely travelled and has made useful technical interactions with Scientific community of United States of America (USA), European Union (EU) and Russia.

Dr Srivastava has been conferred with many highly prestigious awards including DRDO Technology Award (1994), DRDO Technology Group Award (2002), DRDO Scientist of the Year (2010) and Kanpur Ratna Award (2010) by All India Conference of Intellectuals, Kanpur Chapter for his valuable contributions in Defence Critical Technologies. He has Fellowships of many Professional Bodies. He is a founder member of 'Steering Group for Development and Growth Of Technical Textiles In India'. He has chaired technical sessions in international conferences and is frequently invited as Guest Speaker in prestigious events. He is also actively associated with Institution of Engineers. Despite his hectic schedules he takes keen interest in academic activities and has guided many students in their thesis work.

Technological Applications of Textile in Defence and Standardization Status

*Shri Arunabh Chowdhury
Directorate General of Quality Assurance
Ministry of Defence*

Textile is the primary necessity of human life and thus carries extremely important role in defence services applications. On the basis of historical background, it is observed that textile has been utilized starting from clothing to storing and holding of arms, ammunitions, all other combat equipments including up-keeping and other logistic requirements of defence services. In the modern era of cutting age technology the textile has gone beyond conventional applications, mostly putting a vital role in protection techniques of armed services. The critical and strategic operational tools of defence protection system in air, water and land involves textile technology. The major requirements for protection of soldiers from adverse climate providing special clothing, shelters, carriage support etc.

Starting from aerial delivery system to underwater utilities, sustainability of warfare is being produced when assembled with the support of textile material. Further medical aids and engineering gears of the armed forces are also reinforced with technical textile and has now become a regular and integral part of defence requirements.

The era of advance technology in textile application is well managed under comprehensive standardization process in Indian defence services. The concept of standardization and cataloguing has always been of prime importance in all the streams of engineering and technology in defence services. The textile products in defence applications properly undergo a systematic process of standardization and thus all the items are taken care of to attain the standard level of safety, security and protection. Additionally the main objective of standardization is to control item proliferation within defence services. The appropriate

standardization process has been of immense help to support systematic transformation of developing technology in defence textile.

Major Application Areas in Defence

The fundamental requirement to achieve performance related to safety, security and protection in defence applications, the textile material serves appropriately in all respect. Thus clothing of defence personnel in different climatic and strategic conditions warrants very uncommon characteristic unlike regular civil requirements. Ruggedness and resistance to ageing on exposure in extreme adverse atmospheres are the specific need in defence clothing applications. Water proof, wind proof, resistance to Infra red detection and protection from ultra violet rays etc are some of the many special requirements essential for defence clothing besides camouflaging effect in different terrains.

Packaging, cushioning and stuffing of arms, ammunitions and armoured equipments and appliances are managed using various textile materials consisting of extraordinary technical features like resistance to moisture, shock and vibration, heat, fire, explosion etc. Such specific material also renders protection from chemical fumes and electromagnetic waves.

Shelters and covers for soldier, equipments and transport logistics including armoured vehicles and biological logistics required for defence purposes are specially designed using textile material and composites treated and coated with various chemical resins and polymers. Such protective ensembles take care of defence utilities during war from hostile climate in difficult terrains.



Infantry soldiers crossing a riverine obstacle in North East.

Technical textiles are now well adopted technology in defence services. The meritorious properties of Nonwoven fabrics such as bulkiness, compressional recovery, light weight, porosity are used to great advantage in the field of cold weather protective clothing. The application in medical core during emergency survival operations has been extremely successful in the battle field. Application of various kinds of dressings, suitors, coverings, linen etc have become very suitable in remote and forward areas including air and water borne terrains.

Critical Aspects of Defence Applications

Protection being the first motive in defence usage, high tenacity, fastness to exposure, thermal insulation, and least degradation in modulus are some of the important features of any textile material desired for defence. The special usage in defence segment are towards medical applications for monitoring and treatment, protective clothing for thermal insulation, barrier properties, visibility, military equipment, security for access control, identification, localisation of persons. The specific properties expected from an uncommon or common textile material

of defence applications are appended below:

- a) Tenacity and tensile properties.
- b) Resistance to water and saline water.
- c) Resistance to acid alkali and other chemicals.
- d) To produce various camouflaging effects.
- e) Resistance to fire and high temperature.

- f) Resistance to Infra Red detection.
- g) Resistance to UV and other electromagnetic radiation.
- h) Resistance to ballistic impacts.
- i) Resistance to microbiological growth and degradation.

It may be of common knowledge that ruggedness of textile material used in defence sector is of the extreme nature because of various rigorous operations exercised regularly in difficult field environments. During prolonged under water exercises, the scope of microbiological growth in the material is the biggest hazard which needs prime importance to be prevented. Such growth adversely affects the health and stability of goods carried in deep sea. The need of fire retardancy in textile substances to protect the goods in storage and armed personnel in war like operations are very strategic in defence services.

In the modern era of most lethal chemical and nuclear warfare, specialized materials and treatments in textile structure serves great protection. Ballistic protection for



Army soldiers guarding the icy frontiers in Siachen.

defence services in all types of environment has now become primary requirements due to growth in armor technology. In this direction again ballistic resistant panels are formed using ultrahigh molecular weight polyethylene which is strong and light weight to cover the desired level of protection to the human body with suitable ergonomical shape and structure. Resistance to thermal imaging in darkness at warfare zone is another important aspect of camouflaging trick in defence services. Uniforms, covering and shelters are also made of textile materials with IR resistance treatments.

Standardization Need

Textile having very important application scope in defence services needs proper standardization of the products to ensure sustainable performance in usage. All the textile items used in application towards protection should serve all the tactical purposes beyond common uses and should have the complete confidence of the troops. The clothing of the service personnel as such assumes greater significance when uniformity and aesthetics is looked upon, besides functional aspects. In order to fulfill the fitness of shape size and drape the clothing as such has been standardized to perfection in complete scientific perspective. Another aspect of standardization takes care of comprehensive protocol requirements of services wherein necessity of respective dresses and uniforms are covered under this domain. The institutional methodologies for setting standards in context to defence textiles have been adopted to ensure service needs of extraordinary long life cycle as well as to safeguard industrial and commercial feasibility.

Starting from flags, lanyards, hospital and medical dresses to ribbon, insignia, and formations signs are

being standardized to the best of its order maintaining complete serviceability, identification and traceability besides inventory management concepts.

Global State of Standardization of Defence Textiles

Defence standards have generally been evolved from the origin of need to ensure proper performance maintainability and repairability and logistical aspects of services. The superior and state of art technology has always being exploited in Global defence industrial sector of any trade. In the same analogy, textile has also been exploited in its best of the technology for defence application throughout the globe. Most tactical, durable and effective in performance has been the requirements of the defence textiles. Therefore innovations at all times get its best opportunity, categorically in defence industry. In order to ensure prevention from any failure, highest of the standards in defence application have been practiced all over the world in the textile industry. Comprehensive trials adhering to all the eventualities in the form of simulations are exercised before concluding fitness of any material, design and process of manufacture. The product of major tactical usage undergoes through total drill of reliability test and further standardized for manufacture design to achieve functional and performance properties. Industrial norms for production of critical textile products involving state of art technology again attains proper standardized process schedule to confine all critical process parameters including qualitative characteristics. Enquiries in defence agencies indicated that on the operational side - that is among battlefield commanders and strategists - the logic of institutional methodology of standardisation favours adopting the minimum number of standards necessary in order to ensure the interoperability of

battlefield systems. In other words, there are both tactical and strategic advantages in diversity in standardization methods for defence.

Developing Technology with Industrial Growth

Growth in industrial momentum engaged in high tech manufacturing process for technological development of the textile products specially required for defence applications has always been quite encouraging. Advances in this area include novel speciality fibres, the use of nanoparticles and the integration of micro-electronic components into textile fabrics and garments. The industry expertise in the fields of polymer technology, specialty fibre yarn and fabric manufacturing, textile finishing, composite integration plays a pivotal role towards rapid standardization of defence textiles.

The major components of environment protection that is thermal, chemical and biological are well achieved with outstanding development towards synthetic fibre, composite material and classical chemical agents. Non-woven textile sprayed with powdered charcoal in a carrier and treated with oil and water repellent fluorocarbon finish offers protection clothing system to filter out and deactivate the toxic species. The combination of microporous membranes, self decontaminating ultra thin materials coating neutralizes toxins instantly leaving no hazardous residue which is used as protective clothing and water filters. Most recent developing technologies of nonwoven, non-particulate fabrics mechanise and wipe the loose carbon particles to adsorb the toxic vapours. Depending upon the weight, the multilayered nonwoven fabrics can be used in the development of filters and chemical protective suit liners. These materials can be functionalized using biocidal materials to make both biological and chemical protective materials.

Research and Development Towards Standardization

Aggressive efforts to consolidate and standardize the improvement and development of textile material, design, processing, integration and upgradation have been made by research analysts and industry as well. In this direction the research programs compatible to future combat strategies and protective gear systems capable of quick response operation to military threats under short bursts of high activity are the directions to lead the approach ahead. Material customization and versatility allow ample scope of design possibilities. Smartness in operational caliber along with high performance delivery enhancing sustainability to exposure has been the key areas of focus. The attributes of interchangeability to accommodate numerous application in various components and sub components to fitness has been another factor of engineering, to standardize with proper database. Innovative and progressive approaches towards upgradation of defence equipments of personal protective nature derive the specific diversity in industrial scenario. The entire outcome related to various stages of trials and operational exercises of defence services along with complete feasible options of alterations and modifications are comprehensively analysed in perspective/objective view ahead of standardizing any model of new ensemble.



Shri Arunabh Chowdhury

Shri Arunabh Chowdhury, Masters in Textile Technology, MIE, The Institution of Engineers (India), Kolkata having seven and half years Industrial experience is currently designated as JAG(NFSG) at the Senior Quality Assurance Estt (GS), Department of Defence Production, Ministry of Defence. He has worked in various textiles mills including Bhilwara Synthetics Ltd, Bhilwara and has been involved with worsted spinning production and SQC Lab of composite unit. He has carried out testing of cotton, synthetic and woolen textiles from fibre to finished material. He is currently serving in Ministry of Defence (DGQA) for nearly 20 years entering as Senior Scientific Officer and has been associated with Development and Quality Assurance of textile and clothing in defence application. He has worked in Quality Assurance of textile and clothing and General stores along with vendor assessment work. He has been associated with product development, specification formulation, defect analysis, quality audit, standardization and cataloguing. He has carried out laboratory testing and field trial analysis of high performance protective textile products. Involved with the testing of coated and laminated fabrics and down feathers. He has served in various foreign assignments of QA at ATI-Veinna, IDFL-Zurich, Intertek-Shanghai.

Optimisation and Advancement

The defence oriented products have to be innovative, functional, customised and of a high quality. Top-quality techniques and technologies are the only possible way to ensure the innovative ability in the development of new products. Research and development, therefore, is of central importance. In particular, the advance textiles sector relies on comprehensive analytical approach due to its varied applications in services. New technologies or

technical innovations alone are unable to cope up with current strategic warfare and also to boost the survival and competitiveness of the trade. Optimisation of emerging trends is the necessity of the time. Fundamental understanding of standards about defence specific needs with optimized selection of material and design is likely to evolve brilliant solutions to maintain manoeuvrability in combat.

Defence specialized product that possess additional intrinsic functional properties are normally not associated with traditional textiles. Today textile science is restructuring and changing rapidly and emerging towards high performance applications and crossing over to heavy duty and high resistance usage. A smart textile is determined as an active classic textile with built-in active function materials, smart materials or active systems. The defence specific requirement is typically a mixture of many generations of technology, involving the retention of large catalogues of otherwise obsolescent standards. With respect to standards for defence use, there are basically two philosophies. One is to establish specific defence standards as and when the need arises, as is done in civilian contexts. The other is to treat most defence specifications for materials, components and systems as a defence standard with a separate identity.

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Defence Textiles: An Overview

*Dr Prashant
UP Textile Technology Institute,
Kanpur*

Among the most demanding sectors of technical textiles defence textiles is one of them. Personal protection for armed forces is required in various situations. Military uniforms must be equipped with protective requirements related to their use battlefield, tanks, aircrafts, underwater etc. including the high hazards such as gravitational forces during high acceleration-deceleration, extreme temperatures ambient conditions, immersion hypothermia etc. The defence textiles have proved to be the major contributor to the technical textiles since last couple of decades. The major sectors of protection under various conditions are ballistics, chemical/biological, detection through odour, noise and visual enhancing devices, flame and thermal, insects and micro-organisms.

The textile scientists have a variety of challenges in terms of fibre type selection, fibre size dyestuff selection, material technical design and functional finish utilization.

For example, a particular dyestuff or pigment is required to achieve infrared protection against detection may not have good colour-fastness. In addition to personnel protection, the defence textiles must have properties for protection against ultraviolet radiation, mildew, static propensity in numerous applications, water penetration and durability to against abrasion etc.,. Protection in defence textiles can be classified into three major components.

- Thermal protection
- Chemical protection
- Biological protection

Application of nano-technologies in defence textiles

Due to their enabling character and the unique properties of materials at

nanoscale, nanotechnologies are particularly suitable for use in technical protective textiles. Their use in this sector is still at an early stage, with research following two main paths:

1. Upgrading functions and performances of existing defence textiles.
2. Development of products with unprecedented characteristics and performance.

This development stream gives rise to two main classes of products: functional protective textiles and smart/intelligent protective textiles. Some of these materials have reached the market, but it must be stressed that many of the most innovative features have not been tested at full scale, remaining in the early stages of development.

Functional Defence Textiles

Although still at a preliminary stage of development, examples of nano enabled defence textiles abound in many fields of application including:

Protection from chemical toxins, toxic agents and poisonous gases

Protective clothing, which protects against harmful agents such as mustard gas or carbon monoxide, have been realised with textiles containing nanoparticles of magnesium oxide, dendrimers or gold and have been shown as more effective than the more commonly utilised charcoal. Further single walled carbon nanotubes (SWCNT) based sensors have been developed for detection of nerve gas agents.

Impact protection

Textiles containing inorganic fullerenes, or multi walled carbon

nanotubes, have shown a superior protection from ballistic impact, in laboratory compared to current materials. Under development is an intelligent fabric called 'Liquid Armour' consisting of 3D spacer textile treated with a specially formulated silicon coating; it remains soft and flexible under normal conditions but becomes instantly rigid when stressed by an impact before returning immediately to a flexible state.

Heat and flame protective textiles

Many nanomaterials (including titanium dioxide, silicon dioxide, clays, and layered double hydroxide) have shown promise as flame retardant additives, enhancers of flame retardant coatings, and providing flame resistance.

Protection from extreme temperatures

Textiles with exceptional insulation performance, providing protection against very low or high temperatures, have been obtained with aerogels (nanoporous structures of amorphous silica gel). These textiles will be advantageous for those working in harsh environments, but also for extreme sport/outdoor activities.

Protection from UV radiation

Textiles exhibiting UV blocking properties find wide application, mostly in sport/outdoor garments. Such properties are obtained by coating textiles with nanoparticles of zinc oxide, or titanium dioxide, and represents one of the first examples of the application of nanotechnologies to the textile sector.

Protection against microbes and bacteria

This feature will provide protective clothing for patients and medical workers, wound dressings, bed linen, masks amongst others but may also be applied to sportswear particularly in terms of odour control. Anti-

microbial/antibacterial activity is obtained using silver nanoparticles. Copper and titanium dioxide nanoparticles have also been tested for this purpose.

Water repellent and stain resistant clothing

Breathability and comfort is highly desirable for a defense person under various combat situations. Water repellent and self cleaning textiles can be obtained by nanoscale modification of the surface roughness resulting in water and dirt rolling off the surface; however, water vapour may still pass through ensuring breathability. Such products are already on the market. These properties may be combined in multifunctional textiles allowing for protection against extreme environmental conditions combined with light weight, antibacterial properties, protection against biological, chemical threats, and ballistic impact. Such products have undergone testing, most notably within the military sector, but there is potential for exploitation in the civilian sector opening wider market opportunities.

Smart/Intelligent Protective Textiles

Smart and interactive/intelligent textiles are the next challenge for nano enhanced defense textiles. Nanoenabled fibres and fabrics allowing for the integration of sensors and electronic devices make the development of garments with new, intelligent functions possible. These garments have the capability to capture inputs from the surroundings or the wearer, and respond accordingly to them. They can also self generate (by incorporating photovoltaic devices for example) or store energy for powering communication functions. Such innovative products, some already quite close to large production but mostly still at experimental level, can help to provide personalised control

and healthcare to patients by allowing the monitoring of physiologic parameters. These capabilities offer an important survival tool to professionals operating in dangerous situations where the monitoring of physiologic parameters, position and/or tracking can be of paramount importance. The activity in this field involves both academia and industry, but the US army has been historically the leader in this field.

Role of fibres

It is the fibres, however, that have the most significant impact over the capability to provide the high performance needed for soldiers, particularly in combat operations. Paramount in this regard is the excellent fibres available for the ballistic protection. Aramid and Polyethylene fibres form the backbone of excellent body armor that is doing a tremendous job in saving lives of soldiers. One of most promising Fibre on the horizon is M5, which is being developed through the combined efforts of DuPont and Magellan systems international. Current efforts are focused on reducing the weight and bulk over the current items and improving moisture management for increased comfort.

Textile Fibres for Ballistic Protection

The main threats to military personnel are fragmenting projectiles rather than bullets. The projectiles originate from grenades, mortars, artillery shells, mines and improvised explosive weapons. The other threats are low velocity bullets from handguns and high velocity bullets from rifles and machine guns.

Earlier, woven silk fabrics were used for ballistic protection. More recently high modulus aliphatic nylon 6.6 with high degree of crystallinity and low elongation was developed and widely used in body armour and as textile reinforcement in composite helmets.

Spectra

Spectra is an ultra high strength polyethylene (PE) fibre. Ultrahigh molecular weight polyethylene is dissolved in an appropriate solvent and fibres are spun through gel spinning technique. These fibres are 10 times stronger than steel, more durable than polyester and has a specific strength 40 percent greater than aramid fibres.

Kevlar

Kevlar a patented fibre of DuPont is widely used in the modern generation of light weight body armours. It consists of long molecular chains produced from poly-phenylene terephthalamide. The chains are highly oriented with strong inter chain bonding that results in unique combination of properties, which include high tensile strength at low weight, low elongation at break, high modulus, low electrical conductivity, high chemical resistance, low thermal shrinkage, high toughness, excellent dimensional stability, high cut resistance and flame resistance. It does not melt and is unaffected by moisture. It is five times stronger than steel on an equal weight basis.

Twaron

Twaron is another pararamid fibre. Due to its high impact resistance this fibre is used for various protective textiles in defense sector. The yarn uses 1000 or more finely spun single filament that acts as an energy sponge, absorbing a bullet's impact and quickly dissipating its energy through engaged and adjacent fibres. Because more filaments are used, the impact is dispersed more quickly.

DSM Dyneema

Dyneema fibre of DSM has extremely high strength to weight ratio and is lower density than water. It has high shock dissipation potential alongwith energy absorption characteristics.

Role of non-wovens

Of great interest is the potential for using non-woven material products in selected items of combat clothing and equipment in defense sector. Evaluations of various non-wovens have resulted in continuous interest and ongoing efforts. One of the characteristics that must be improved for military use is the durability that is reduced resulting from abrasion resistance. Efforts are underway worldwide to develop the performance of defense textile materials through nanotechnology and electro textiles.

Type of protections in defence textiles

Various type of protection must be provided to defense persons to improve their efficiency and life safety.

Thermal Protection

Thermal insulation depends on the entrapment of still air in the structure. Fibres, yarns and fabrics offer a very large surface area to trap the maximum amount of still air. Finer fibres tend to entrap more still air than coarse fibres for the same bulk, although they tend to produce dense felt-like structures. An efficient insulator will comprise of 10-20 percent of suitably dispersed fibre and 80-90 percent air. Textiles have advantage of low density, good resilience, good drape and handle, easy care and durability. The units of measuring thermal insulation are warmth/thickness Tog/cm. Micro fibre batting such as Thinsulite exhibit higher values of 3.0 Tog/cm due to their larger surface area.

Chemical Protection

These effects are insidious, lethally horrific and raise highly emotional fears. The classical chemical agent, mustard attacks moist skin, tissues and respiratory tract causing severe blistering, swelling and burns. Nerve

agents affect the transmission of nerve impulses in the body.

Biological Protection

Classical agents include bacteria and viruses. The essential protection devices for individuals are nasal or full face respirators which filter out and deactivate the toxic species. One or two piece suits with hoods and efficient seals, gloves and overboot complete the ensemble. Clothing is made of completely impermeable butyl rubber materials but the physiological load imposed means that they can be worn only short periods. Also in use is a disposable two layer suit comprising of an inner non-woven textile sprayed with powdered charcoal in a carrier and treated with an oil and water repellent fluorocarbon finish. The outer layer is a woven twill fabric comprising of a nylon filament warp with modacrylic weft which carries a water repellent finish. This layer is designed to wick and spread oleophilic agents to evaporate as much as possible before it transfers to the charcoal layer underneath.

Impact Protection Textiles:

Active protection system (APS) is an intelligent fabric that consists of 3-D spacer textile treated with specially formulated, response silicon coating. It remains soft and flexible under normal conditions but when stressed under high impact force; the material instantly becomes rigid and then immediately returns to a flexible state. This innovative material offers the unique combination of benefits that is particularly suited for use in high performance protective apparel and equipment.

Stab and Ballistic Protection

These are the vests that protect their wearer against the twin threats of bullet and knives. The vests combine two established technologies:

- Bekaerts steel cord (Steel skin) gives the wearer stab protection
- DSMs high performance polyethylene fibre (Dyneema) provides ballistic protection

A combination of these two materials offers the body armor manufacturers the chance to make dual-protection vests that are lighter in weight. Vests made with Dyneema fibre provide ballistic protection at an extremely low weight and together with flexibility, this leads to increased comfort for the user. Steel cord fabrics provide stab protection against the edged weapons. Steel skin actually blunts and damages a blade with each thrust while Dyneema provides exceptional energy absorption to stop damaged knife and to minimize trauma. Dyneema is a fibre from ultrahigh molecular weight polyethylene that is both strong and lightweight: on a weight for weight basis, it is 15 times stronger than steel and up to 40 percent stronger than aramid fibres, but it floats on water. Dyneema is extremely durable and resistant to moisture, ultra-violet radiations and chemicals.

Flames, Heat and Flash Protection

Personnel operating in confined spaces such as armoured vehicles, ships submarines and aircraft are at high risk of burns, as are ground troops are exposed to nuclear weapons. Fires in confined space produce toxic products which can kill and smoke which hinders escape. Modern thermoplastic fibres can melt and drip injuring humans and spreading the fire in furnishing and fittings. The most widely used flame retardant material in forces is Proban treated cotton, alone or in blends with up to 30 percent polyester. Its advantages are low cost, wide availability and low shrinkage in fire.

Protection against contamination

Major emphasis now-a-days is also given to development of decontaminated textiles for defense persons. Decontamination is the process of neutralizing or removing chemical or biological agents from people, equipment, and the environment. For military purposes, decontamination must restore the combat effectiveness of equipment and personnel as rapidly as possible. Current R and D is focused on the development of decontamination systems to overcome these limitations and effectively decontaminate a broad spectrum of chemical and biological agents from all surfaces and materials. Because of the vastly different characteristics of personnel, personal equipment, interior equipment, exterior equipment, and large outdoor areas, situation-specific decontamination systems must be developed. In one of the existing technology it is based on micro-porous membranes. The new microporous membranes have been developed at the U.S. Army Natick Soldier Center using the process of electro-spinning.

In another development the U.S. Army Edgewood Chemical Biological Center (ECBC) developed a patented technology to neutralize organo-phosphorus chemical agents and pesticides. This enzyme-based technology simplifies and improves the process of decontaminating a class of highly toxic chemicals, including nerve agents. Other decontamination methods use corrosive chemicals that are more costly, less efficient, and generate a substantial amount of residue waste.

Environmental Issues

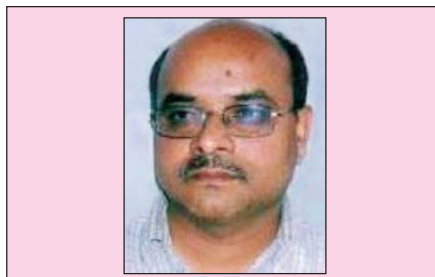
Military ground forces face the most difficult operational conditions of all. Modern forces such as infantry,

marines and parachutes operates as lightly equipped, highly mobile brigades who are expected to move at short notice to any part of the world. Once in place they have to wear or carry all their personal equipments and can be exposed to wide range of environmental conditions. Unlike civilians, ground forces cannot choose to operate in good weather, nor can they control over their work rates. Soldiers typically operate in short bursts of high activity, running, carrying equipment and weapons. Keeping dry and comfortable is essential. Excessive activity and sweating in a cold climate followed by inactivity can lead to hypothermia, whereas high work rates whilst wearing layers of protective clothing in hot climates lead to hyperthermia. These conditions can lead to illness or death.

All military power of the world have research activities targeted towards future combat and protective clothing as integrated systems for defense applications. The research objectives are focused to fight with military threats or capability gaps doctrine. The improvement in protection level of defense textiles alongwith incorporation of functionalities is mainly targeted to :

- Reduce weight and bulk of materials
- Improve protection against natural and battlefield threats
- Integrate functionality so that fewer layers provide multi layer protection
- Maintain thermo-physiological comfort or survival in extreme conditions
- Reduce life cycle costs by making systems more effective, durable, and recyclable and by buying few components in the system

- Important in the quest to eliminate or minimise the risk of injuries, accidents, and infections rising from a variety of threats and environments.
- Nanotechnologies can play a fundamental role in the development of improved or novel multifunctional defense textiles by providing higher levels of protection and higher levels of comfort.
- Improve compatibility between and within different clothing components



Dr Prashant

Dr Prashant is Associate Professor and Head of Department, Manmade Fibre Technology at U.P. Technical Textile Institute, Kanpur. He has done his graduation in Textile Technology from Government Central Textile Institute followed by M.Tech and Ph.D in Textile Engineering from IIT, Delhi. He has worked as Asst R and D Superintendent in Vardhman before joining GCTI Kanpur as Lecturer (Spinning). He is currently working as Associate Professor in Textile Technology since March 2010. He has published several research papers in national and international journals and one research paper in international conference.

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Standardization in Parachute Canopy Fabrics and Accessories

Shri A K Bera
Textiles,
Bureau of Indian Standards

The word 'parachute' comes from the French prefix *paracete*, originally from the Greek, meaning *to protect against*, and *chute*, the French word for 'fall', and it was originally coined, as a hybrid word which meant literally 'that which protects against a fall', by the French aeronaut François Blanchard (1753–1809) in 1785.

A parachute is a device used to slow the motion of an object through the atmosphere by creating drag or aerodynamic lift. Parachutes are usually made out of light, strong cloth, originally silk or cotton, now most commonly nylon. Parachutes must slow an object's terminal vertical speed by a minimum 75 percent in order to be classified as such. Parachutes are used for aerial delivery of men, materials/cargo, heavy equipment, vehicles etc. Besides, they are widely used as air decelerators for arresting the high speed of fighter aircrafts during landing to reduce wear and tear of the braking mechanism of the aircrafts. Parachutes are also used for accurate bomb dropping, controlled descent of flares etc.

Technical textiles comprise more than 95 percent of most of the parachute systems in the form of canopy fabric, harness, webbing, tapes, rigging lines, sewing, etc. Unlike other conventional applications, fabrics used for canopy of parachutes are essentially required to satisfy certain functional requirements which are of secondary importance in the case of usages like apparel, furnishing, industrial etc. For a fabric to be used as parachute canopy, it has to possess all the basic qualities of a good cloth and in addition, it must behave like an engineering material governed by rigid tolerances in respect of certain parameters which may or may not be important for normal applications. The basic properties of canopy fabric constituting 80 percent of the

parachutes, which are most significant to the performance and design of parachutes, are strength, weight and air porosity. These properties are closely inter-related and the change in any of these properties would throw the others out of balance.

Parachute Canopy fabrics and other technical textile accessories are required for following types of parachutes:

- Man carrying parachutes for paratroops
- Air crew parachutes
- Heavy dropping parachute systems for dropping vehicles, guns etc.
- Cargo parachute system for supply dropping
- Flare parachutes
- Parachutes for bomb dropping
- Para gliding
- Steerable parachutes
- High altitude parachutes
- Sports parachutes.

Parachute canopy fabrics are woven from high tensile nylon multifilament in the denier range of 32 to 200 deniers. Cargo parachutes are generally made from cotton fabrics of specific strength. Harness, webbing, tapes etc. are made from high tensile nylon yarn of denier range 210 to 840 denier. Major consumer of parachutes is defence forces. Besides, sports parachutes and para gliding are used in civil sector, which is gaining popularity slowly. This article focused Indian textile industries opportunity in domestic and global market. It clearly indicates there is insufficient supply of raw material and finished products. When the textile industry overcomes the opportunity and the strength then there will be a chance to rule the technical textile industry.

Continue on page 23

DRAFT INDIAN STANDARDS

The following Draft Indian Standards have been issued for eliciting technical comments.

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Document No.	Title	Last Date of Comments
Electrotechnical		
ETD 03 (6638)	Test Methods for Quantitative Determination of Corrosive Sulphur Compounds in unused and used Insulating Liquids – Part 1 Test Method for Quantitative Determination of Dibenzylidissulfide (DBDS) [IEC 62697-1 (2012)]	30 08 2013
ETD 16 (6648)	Outdoor Type Oil Immersed Distribution Transformers upto and including 2500 Kva, 33Kv [<i>Fourth Revision</i> of IS 1180 (Part 1)]	30 08 2013
ETD 23 (6658)	Double Capped – Fluorescent Lamps – Safety Specifications – IEC 61195 Ed. 2.1 (2012)	22 09 2013
ETD 23 (6659)	Method of Measurement of Centre Beam Intensity and Beam – Angles(S) of Reflector Lamps IEC/TR 61341 Ed. 2.0 (2010)	22 09 2013
ETD 14 (6663)	Switches for household and similar fixed electrical installations Part 2-1 : Particular requirements – Electronic switches [IEC 60669-2-1 (2009)]	30 09 2013
ETD 14 (6664)	Plugs and socket-outlets for household and similar purposes Part 2-5 : Particular requirements for adaptors [IEC 60884-2-5 (1995)]	30 09 2013
ETD 25 (6598) R	Installation And Maintenance of Lifts For Handicapped Persons – Code of Practice (<i>First Revision</i> of IS 15330)	23 09 2013
ETD 20 (6667)	Code of Practice for Earthing (<i>Second Revision</i> of IS 3043)	15 10 2013
Medical Equipment and Hospital Planning		
MHD 19 (288)/ ISO 10993-12 : 2012	Biological Evaluation of Medical Devices – Part 12 Sample Preparation and Reference Materials	26 08 2013
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Document No.	Title	Last Date of Comments
MHD 19 (290)/ ISO 10993-20 : 2006	Biological Evaluation of Medical Devices – Part 20 Principles and Methods for Immunotoxicology Testing of Medical Devices	26 08 2013
MHD 19 (291)/ ISO 14155 : 2011	Clinical Investigation of Medical Devices for Human Subjects-Good Clinical Practice	26 08 2013
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MHD 11 (0235)/ ISO 5356-2 : 2012	Anesthetic and Respiratory Equipment – Conical Connectors Part 2 Screw Threaded Weight Bearing	30 09 2013
MHD 11 (0236)/ ISO 4135 : 2001	Anesthetic and Respiratory Equipment – Vocabulary	30 09 2013
MHD 11 (0299)/ ISO 11712 : 2009	Anaesthetic and Respiratory Equipment – Supralaryngeal Airways and Connectors	30 09 2013
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PGD 01 (1281)	Quantities and units – Part 11 Characteristic Numbers (Adoption of ISO 80000-11 : 2008)	15 10 2013
PGD 01 (1282)	Quantities and Units – Part 13 Information Science and Technology (Adoption of ISO 80000-13 : 2008)	15 10 2013
PGD 01 (1283)	Quantities and Units – Part 14 Telebiometrics related to Human Physiology (Adoption of ISO 80000-14 : 2008)	15 10 2013

Document No.	Title	Last Date of Comments
PGD 01 (1284)	Graphical Symbols – Test Methods Part 1 Methods for Testing Comprehensibility (Adoption of ISO 9186-1 : 2007)	15 10 2013
PGD 01 (1285)	Graphical Symbols – Test Methods – Part 2 Methods for Testing Perceptual Quality (Adoption of ISO 9186-2 : 2008)	15 10 2013
PGD 01 (1286)	Conditioning and Testing – Standard Atmospheres – Definitions (Adoption of ISO 558 : 1980)	15 10 2013
PGD 01 (1287) ISO/ IEC Guide 74 : 2004	Graphical Symbols – Technical Guidelines for the Consideration of Consumers' needs	15 10 2013
PGD 08 (1288)/ ISO 15744 : 2002 (E)	Hand-held Non-electric Power Tools Noise Measurement Code – Engineering Method (Grade 2)	15 09 2013
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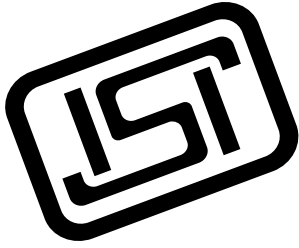
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Standardization in parachute canopy fabrics and accessories is being looked after by Textile Materials for Aerospace Purposes Sectional Committee, TXD 13 functioning under the Textile Division Council (TXDC). The scope of TXD 13 is to formulate Indian Standards for terminology, methods of test and specifications for all textile materials for aerospace purposes. The Sectional Committee is presently chaired by the Director, Aerial Delivery Research and Development Establishment, Agra which is functioning under Defence Research and Development Organization (DRDO), Ministry of Defence. The following standards pertaining to parachutes have been formulated by the sectional committee, TXD 13 so far:

IS 1376 : 1998 Textiles – Cotton Sewing Threads for Aerospace Purposes – Specification (Third Revision)

This standard specifies constructional parameters and other requirements for fifteen varieties of cotton sewing threads used for aerospace purposes incorporating requirements of rot proofing, moisture content, pH of aqueous extract, water soluble chlorides, water soluble sulphates, water soluble matter and ash content. The standard also specifies conditions namely, scoured, dyed, bleached etc in which the sewing thread is to be supplied.

IS 2196 : 1985 Linen Sewing Thread for Aeronautical Purposes (Second Revision)

This standard specifies the constructional details and other particulars of three varieties of linen (flax) sewing thread for aerospace purposes which are to be used for all sewing operations.

IS 2197 : 2000 Aerospace textiles – Braided (Plaited) Linen (flax) Lacing Cord – Specification (Second Revision)

Braided linen cords prescribed in this standard is intended for use in lacing

fabric on aircraft fuselages, wings and other surfaces. This standard specifies constructional and other parameters of braided (plaited) linen (flax) lacing cord for aerospace purposes. It requires rot proofing with pentachlorophenyl (PCPL) from aqueous emulsion or any other rot proofing chemicals. The requirements of residual alkali solubility, wax finishing and surface finish have also been included.

IS 2965 : 1987 Breaking Cord for Cotton Parachutes (First Revision)

This standard prescribes constructional details and other requirements of breaking cord for cotton parachutes used in equipment/cargo aerial delivery. The cord is manufactured from well-twisted strands of single yarns and consists of doubling twist inserted uniformly throughout its length. It is either twisted or braided. The turns per metre of the yarn is so adjusted as to produce a balanced twist cord. The breaking cord can be supplied in scoured and rot-proofed or scoured, dyed and rot-proofed condition. Use of sulphur dyes is not permitted in this specification. The breaking cord in braided construction is also permissible provided it complies with the requirements of mass and breaking load along with the chemical requirements.

IS 2970 : 1987 Specification for Cotton Fabrics for Supply Dropping Parachutes (First Revision)

This standard prescribes the requirements for two types of cotton fabrics used in the fabrication of parachutes intended for supply dropping purposes. Constructional parameters of the fabric have been made suggestive provided it meets the functional requirements air permeability, breaking load, etc. Cotton fabric of Type 1 is generally used in the fabrication of parachutes having a diameter of 18 m and is

intended for heavy supply dropping. Cotton fabric of Type 2 is generally used in the fabrication of parachutes having a diameter 8.5 m and is intended for light supplies dropping.

IS 3244 : 1965 Specification for Cotton Webbing, Statchute

Webbing conforming to this standard is intended for use in para-connected items, such as harnessing supplies to the parachutes. This standard prescribes constructional details and other particulars of cotton webbing, statchute, scoured, used in supply dropping parachutes. This standard does not specify the general appearance, feel, etc of the webbing. This standard also contains clauses which call for agreement between the buyer and the seller and which permit the buyer to use his option for selection to suit his requirement.

IS 3255 : 1979 Specification for Scoured or Dyed Cotton Tapes for Aerospace Purposes (First Revision)

The cotton tapes covered in this standard are used in supply dropping parachutes and for reinforcement of the canopies. This standard covers scoured and/or dyed cotton tapes of width 12.7, 19.0, 25.0, 28.5, 31.7, 38.0, 44.4, 50.0, 57.0, 63.5, 75.0, 89 and 102 mm. The tape is manufactured from unsized 3-ply cotton yarn free from spinning defects

IS 3449 : 1984 Specification for Cotton Webbing for Parachutes (Second Revision)

This standard was originally published in 1966 and subsequently revised in 1979 and again in 1984 to take care of the modifications recommended by the Aerial Delivery Research and Development Establishment, Agra. This standard specifies the requirements for two types of cotton webbing one of width 38 mm and the other of width 75 mm used mainly in the fabrication of man-dropping parachutes.

IS 3846 : 1984 Specification for Rot-Proofed Cotton Tapes for Aerospace Purposes (First Revision)

Tapes conforming to this standard are intended for use on metallic surfaces of the aircraft, such as ribs, leading edge, trailing edge and any other part to be subsequently covered with fabric. The majority of widths of tapes for which details of construction and properties have been specified are multiples of 5 mm and it is hoped that only those tapes, or others in the same category, will be used in new designs. Details of three widths which are not multiples of 5 mm are also given, as an interim measure only; these are non-preferred widths. Shuttleless construction is not permitted in these tapes.

IS 4228 : 1979 Specification for Nylon Tapes for Aerospace Purposes (First Revision)

The tapes covered in the standard are used in the manufacture of various aerial delivery equipment including man-dropping parachutes. This standard covers nylon tapes of 14, 19, 25, 32, 38, 44 and 25.4 mm width. Multifilament, bright and high tenacity nylon yarn of 23, 46 or 92 tex is used in the manufacture of these tapes. Use of acid or disperse dye is permitted but metallized or chrome dyes are not permitted for dyeing of these tapes.

IS 4229 : 1992 Textiles – Nylon Sewing Threads for Aerospace Purposes – Specification (Second Revision)

This standard prescribes the constructional particulars and performance requirements for six varieties of nylon sewing threads used in stitching aerospace textile materials. Bright continuous multifilament yarn of nylon 6 or nylon 6,6 is used for the manufacture of this sewing thread. The relaxation with respect to breaking strength, extension at break and length per

unit mass for the dyed threads is included in the specification.

IS 4719 : 1984 Specification for Wire-Woven Rayon Fabric for Aerospace Purposes (Second Revision)

This specification covers wire-woven rayon fabric used mainly for radar responsive target sleeves. This standard was first published in 1968 and subsequently revised in 1979 and 1984 to make it up-to-date in the light of the experience gained. A method for determination of the coefficient of radar reflection of the fabric has been added.

IS 4726 : 1984 Specification for Light Weight Nylon Fabric for Parachutes (First Revision)

This standard covers the requirements of light weight nylon fabric for parachutes. The fabric is used in the fabrication of parachutes intended for personnel and other aerial delivery purposes. The yarn used in the manufacture of this fabric is high tenacity, multi-filament, bright, nylon 6 or nylon 6,6.

IS 4727 : 1968 Specification for Nylon Webbing for Aeronautical Purposes

This standard prescribes the constructional details and other particulars of two types of nylon webbing, undyed and dyed, used in personnel parachutes and other aeronautical purposes. This standard does not specify the general appearance, feel etc, of the webbing. It also contains certain clauses which call for agreement between the buyer and the seller for permitting the buyer to use his option for selection to suit his requirements. Bright and high tenacity nylon yarn of 840 d is used in the manufacture of this webbing.

IS 6349 : 1981 Specification for Tape, Nylon, Tubular for Aerospace Applications (First Revision)

This standard covers two types of

tubular nylon tapes used in the aerial delivery equipment including parachutes.

IS 11326 : 1985 Specification for Nylon Fabrics for Coating with Natural or Synthetic Elastomers

This standard specifies the requirements for a series of nylon fabrics suitable for coating with natural or synthetic elastomers for subsequent use primarily in the manufacture of safety and survival equipment for aerospace purposes. For preparing this standard considerable assistance has been derived from BS F127-1983 Specification for nylon fabrics for coating with natural or synthetic elastomers issued by the British Standards Institution.

IS 14564 : 1998 Textiles – Cotton Tapes for Personnel Parachutes – Specification

This standard covers three varieties of scoured and undyed 6.5 mm wide cotton tape generally used in the fabrication of parachutes and other aerial delivery equipments. The three varieties have 7, 21 and 28 ends of 30 x 12 tex, 30 x 4 tex and 30 x 3 tex respectively in full width and the breaking load is same for all the three varieties.

New canopy fabrics 24, 28, 32, 48 and 93 gsm have also been developed and after revalidating the parameters new varieties will be proposed in the existing specification IS 4726. Heat setting is also being considered as an optional process for tapes, webbing and cords and this may be taken up for standardization at a later date. Measurement of fabric stability is another area where a test method is being developed. Kevlar narrow fabric for aerospace purposes and Para-aramid materials for aerospace purposes are also under consideration as new subjects for standardization.

Rajiv Gandhi National Quality Award (RGNQA) Awareness Programme

Faridabad

A half day Awareness Programme on Rajiv Gandhi National Quality Award 2012 was held on 12 July 2013 at Faridabad. Various participants attended the Awareness programme from various sectors and Health Care Sectors; Education Sectors, IT Sector and Manufacturing Sector.



The Awareness Programme began with the welcome address by Shri Desh Deepak, Sc-F and Head (FDO). Shri Desh Deepak apprised all the participants regarding the purpose and importance of Rajiv Gandhi National Quality Award. He informed about the previous recipients who have excelled becoming the benchmark of quality in their respective fields and also the various sectors for which these awards are given. Shri Desh Deepak further emphasized that even preparing for participation in Rajiv Gandhi National Quality Award per se enhances the quality of organization. He also informed the participants regarding financial incentives in the form of cash awards associated with Rajiv Gandhi National Quality Award.

The welcome address was followed by a comprehensive talk delivered by Shri J C Arora, Sc-F and Head (WRD), – the nominated faculty – through discussion on enabler's parameters, for example, Leadership, Policies, Objectives and Strategies, Human Resources Management, Consumer Focus Results, Employee Satisfaction and Impact on Environment and Society.

In addition to this, the award winner, Shri A K Gupta, MD, Pharma Synd Industries Ltd, New Delhi shared his experience of competing for Rajiv Gandhi National Quality Award. He shared his experience of applying for these awards and gave them insight how to analyze the strength and weakness with respect to various parameters in the field of quality.

The experience was also shared by one of the participants Wg. Commander, I J Bhalla, Wings Automobiles, who was also one of the recipients of RGNQA. It was followed by open discussion where participant's queries especially regarding filling up of application form was answered to the full satisfaction.

Ahmedabad

A one-day seminar on Rajiv Gandhi National Quality Award 2012 was organized on 12 July 2013 at Ahmedabad. The programme was attended by participants from large and small scale sector industries of Gujarat. Dr S L Palkar, Sc-F and Head, Ahmedabad Branch Office welcomed the participants and informed about the significance of Rajiv Gandhi National Quality Award. Shri Roshan Lal, Sc-E, informed the participants about the objective of the seminar.

He also informed the participants about the benefits derived by the winners of above award. Shri Devdutt Jha, Sc-F and Head, MDM-I, who was the guest speaker, inaugurated the seminar.

The inaugural session was followed by Technical Session. Shri Devdutt Jha, Sc-F and Head, MDM-I presented the



overview of assessment process and national awards committee, followed by evaluation norms of nine parameters for considering the award. Shri U D Fatak, GM Technical, M/s Ultratech Cement Ltd, and Dr Prahlad Vaghela, Dy Manager, Banas Dairy, Palanpur, the Award winners of previous year, shared their experience gained at the time of assessment of their firms with the participants.

The seminar was concluded after lot of deliberations and queries raised by the prospective applicants were well addressed by Shri Devdutt Jha.

At the end of the seminar, Dr S L Palkar, encouraged the participants to apply for Rajiv Gandhi National Quality Award 2012.

Western Regional Office, Mumbai

To facilitate the awareness among the industries for Rajiv Gandhi National Quality Award 2012. Shri Dev Dutt Jha, Sc-F and Head, MOM-1 conducted one day awareness programme at the following places:

Pune:— On 5 July 2013 the programme was organized by BIS Pune. During the seminar participants from various industries of Pune Region including Western Maharashtra participated in the Seminar. The programme objectives were given by Shri Subash Nayak, Sc-B, and the programme was inaugurated by Shri B M Haneef, Sc-F and Head, BIS Pune. The entire session was interactive and prospective applicants actively participated in the programme. Mr George Eapan, CEO. Jehanhir Hospital Pune, Rajiv Gandhi National Quality Award 2011 award winner shared his experience with the participants.

Ahmedabad:— On 12 July 2013 the programme was organized at Ahmedabad and welcome address was given by Shri S L Palkar, Sc-F and Head BIS Ahmedabad. Shri Dev Dutt Jha, inaugurated the programme and also conducted the Technical sessions. The programme was organized by BIS Ahmedabad. During the programme lot of enthusiasm was observed from the participants in interactive mode. Dr Prahlad Vaghela, Banas Dairy Palanpur and Shri Fatak, Vice-President, Ultratech Cement Amreli, Gujarat, Award Winner RGNQA 2011 shared their experience respectively with the participants. Shri Roshan Lal and Shri Sanjeev Mohan, BIS conducted the programme.

Central Regional Office, New Delhi

An awareness programme on Rajiv Gandhi National Quality Award (RGNQA) for the year 2012, was



organized by Central Regional Office (CRO), joined by Marks Department I, II and III along with Management Systems Certification Officer (Central Region) (MSCO(C) and Standards Promotion and Consumer Affairs Department (SP&CAD), on 10 July 2013 at Manak Bhawan Auditorium, New Delhi. The programme was inaugurated by Shri S K Khanna, Deputy Director General (Central Region). The programme was attended by licensees, applicants and other interested groups of areas of Delhi and around. Several persons actively participated in the awareness programme.

The participants were made aware about various criteria required for qualifying Rajiv Gandhi National Quality Award by Shri J Roy Chowdhary, Sc-F (IR and TISD). A lively experience was shared by Shri A K Gupta, Managing Director of M/s Pharma-synth Formulations Ltd, Delhi and a previous awardee of Rajiv Gandhi National Quality Award. The programme was conducted by Dr R K Singh, Sc-F and Head (MDD-I).

Dehradun

A Seminar on Achieving Excellence in Quality – Rajiv Gandhi National Quality Award was organized by Dehradun Branch Office on Friday 28 June 2013 at Haridwar. Several participants licensees and non-licensees attended the seminar.



The welcome address was followed by a presentation on the programme objectives and the inaugural address. Three technical sessions on the subject were presented by Shri U Thanu, Sc-F and Head (Electrical Laboratory). A presentation was also made by Shri A K Gupta of M/s Pharma Synth Formulations Ltd, Haridwar, winner of the commendation certificate in the RGNQA 2011. Shri Gupta shared his experiences and encouraged the participants to make applications for this prestigious award.

हिन्दी कार्यशाला

पटना

पटना शाखा कार्यालय एवं प्रयोगशाला में दिनांक 28 जून 2013 को हिन्दी कार्यशाला का आयोजन किया गया। कार्यशाला का उद्घाटन वैज्ञानिक एफ एवं प्रमुख श्री शंकर नाथ चटर्जी द्वारा किया गया। अपने उद्घाटन भाषण में श्री चटर्जी ने सभी अधिकारियों एवं कर्मचारियों को संबोधित करते हुए कहा कि आज बदले परिदृश्य में हिन्दी में काम करना समय की मांग ही नहीं अपितु हमारा संवैधानिक दायित्व भी है। अतः हम सभी हिन्दी में काम करके राष्ट्रीय दायित्व का निर्वहन करें साथ ही संवैधानिक उपबंधों का पालन करें। श्री प्रभुनन्दन झा, सहायक एवं नोडल कर्मचारी (हिन्दी) ने राजभाषा नियम, अधिनियम से सभी को अवगत कराया साथ ही हिन्दी में काम करने के विभिन्न जांच बिन्दु के बारे में बताया। हिन्दी पुरस्कार योजनाओं के बारे में विस्तार से चर्चा की गयी। हिन्दी में छोटी-छोटी टिप्पणियों पर चर्चा की गयी।



श्री अरशद महमूद, वैज्ञानिक एफ एवं प्रमुख (प्रयोगशाला) ने अपने वक्तव्य में सभी उपस्थित प्रतिभागियों से हिन्दी में अधिकाधिक काम करने की अपील की, क्योंकि हमारा कार्यालय 'क' क्षेत्र में अवस्थित है। इस अवसर पर श्री तपन हाजरा, सहायक द्वारा स्वरचित हिन्दी में अधिकाधिक काम करने संबंधी एक बहुत ही रोचक कविता का पाठ किया गया।

भोपाल

भारतीय मानक ब्यूरो, भोपाल शाखा कार्यालय में दिनांक 26 जून 2013 को हिन्दी कार्यशाला का आयोजन किया गया। कार्यशाला का उद्घाटन श्री विष्णु गुप्ता, वैज्ञानिक एफ एवं

प्रमुख, श्री ए के भटनागर, वैज्ञानिक एफ एवं श्री सन्त लाल, वैज्ञानिक ई एवं नोडल अधिकारी हिन्दी ने परम्परागत रूप से द्वीप प्रज्ज्वलित कर किया।

इस अवसर पर श्री विष्णु गुप्ता, वैज्ञानिक एफ एवं प्रमुख ने अपने उद्बोधन में कहा कि भारतीय मानक ब्यूरो में किये जाने वाले अधिकांश कार्य तकनीकी स्वभाव के होने के बावजूद यहां अधिकतर कार्य हिन्दी भाषा में होना प्रशंसा एवं संतोष का विषय है। उन्होंने समस्त अधिकारियों/कर्मचारियों को इस बाबत बधाई दी। उन्होंने इस अवसर पर आह्वान किया कि हमारे द्वारा प्रदान की जाने वाली सेवाएं सीधे, सम्पूर्ण, समयबद्ध तथा संतोषजनक होनी चाहिए।

कार्यशाला के प्रशिक्षण सत्र में श्री ए के भटनागर, वैज्ञानिक एफ ने व्यक्तित्व विकास विषय पर सारगर्भित प्रशिक्षण प्रदान किया जिसे समस्त अधिकारियों/कर्मचारियों ने आत्मसात किया एवं विषय के संबंध में अपनी जिज्ञासाओं का समाधान पाया।

इस अवसर पर श्री विष्णु गुप्ता, वैज्ञानिक एफ एवं प्रमुख ने प्रशिक्षण सत्र में कार्यालयी कार्य में नोटशीट का उपयोग विषय पर व्याख्यान दिया एवं नोटशीट लेखन एवं संधारण विषय पर महत्वपूर्ण व्याख्यान दिया।

श्री सन्त लाल, वैज्ञानिक ई एवं नोडल अधिकारी हिन्दी ने भी समस्त अधिकारियों/कर्मचारियों से शतप्रतिशत कार्य हिन्दी में करने का आह्वान किया व कार्यशाला का संचालन किया।

लखनऊ

दिनांक 17 जून 2013 को त्रैमासिक हिन्दी कार्यशाला का आयोजन कार्यालय परिसर में किया गया, जिसमें कार्यालय के सभी अधिकारियों एवं कर्मचारियों ने भाग लिया। कार्यशाला का शुभारम्भ श्री एस के कुरील, सहायक निदेशक/प्रशा. एवं वित्त/एवं हिन्दी अधिकारी ने सभी का स्वागत करते हुए किया। इस कार्यशाला की अध्यक्षता डा आर के बजाज, वैज्ञानिक एफ एवं प्रमुख ने की उन्होंने अपने व्याख्यान में कहा कि हमें कार्यालय के अधिकाधिक कार्य हिन्दी में करने चाहिए तथा राजभाषा के नियमों का अनुपालन करते हुए कार्यालय के अभिलेखों के रखरखाव में अनिवार्य रूप से हिन्दी अथवा द्विभाषिक रूप में करना चाहिए। सिर्फ पुरस्कारों के लिए नहीं, अपितु गौरव भाव से हिन्दी का प्रयोग करना चाहिए क्योंकि सौभाग्य से हमारे कार्यालय में सभी अधिकारी एवं कर्मचारी हिन्दी में कार्य करने में पूर्ण रूप से सक्षम हैं। अंग्रेजी के मोह को छोड़कर हिन्दी को सगर्व प्रयोग करना चाहिए। हमें अपने हिन्दी कार्य के प्रतिशत को दिनोदिन आगे बढ़ाना चाहिए।

कार्यशाला के मुख्य अतिथि डॉ विजय नारायण तिवारी, हिन्दी अधिकारी, सी डी आर आई, लखनऊ थे। उन्होंने अपने व्याख्यान में राजभाषा नियम एवं अधिनियमों की विस्तारपूर्वक

जानकारी दी और साथ ही आजादी के बाद हिन्दी के संवैधानिक विकास की यात्रा पर भी प्रकाश डाला, उन्होंने कहा कि किसी भी राष्ट्र के सर्वांगीण विकास के लिए महत्वपूर्ण कारकों में एक उसकी मातृभाषा भी है। आज दुनिया के तमाम विकसित देश ऐसे हैं जो अपनी मातृभाषा में काम कर रहे हैं क्योंकि उनका मानव संसाधन अपनी शत प्रतिशत शक्ति देश के विकास में व्यय कर सकता है उसे अपनी ऊर्जा किसी अन्य भाषा को सीखने में व्यर्थ नहीं करनी पड़ती है। उन्होंने यह भी कहा कि हिन्दी को राजभाषा से राष्ट्र भाषा बनाने के लिए अदम्य इच्छाशक्ति की आवश्यकता है। यद्यपि भारत में भाषिक विविधता के कारण यह एक आसान कार्य नहीं है किन्तु आजादी के बाद से अब तक हिन्दी का प्रचार प्रसार सराहनीय रहा है।

देहरादून

देहरादून शाखा कार्यालय में दिनांक 26 जून 2013 को हिन्दी कार्यशाला का आयोजन किया गया जिसका शुभारंभ कार्यालय प्रमुख श्री दिलीप कुमार ने किया। इस अवसर पर अतिथि वक्ता के रूप में आमंत्रित डॉ निदेश चमोला भी उपस्थित थे।

श्री दिलीप कुमार, प्रमुख देहरादून, भारतीय मानक ब्यूरो, ने इस अवसर पर कहा हमारे कार्यालय का जो कार्य हिंदी में किया जा रहा है, उसके माध्यम से राजभाषा विभाग एवं मुख्यालय द्वारा दिये जा रहे सभी लक्ष्यों को प्राप्त किया जा रहा है। लेकिन यदि हम कार्यालय के कार्य हिंदी में करने की आदत बना लें तो सभी लक्ष्य स्वतः ही प्राप्त हो जायेंगे फिर हमें हिंदी में कार्य करने के किसी भी लक्ष्य को प्राप्त करने के लिये विशेष प्रयास करने की आवश्यकता नहीं रहेगी। ऐसा करने से हम राष्ट्र भाषा का सम्मान करते हुए एक-दूसरे को हिंदी में कार्य करने के लिए प्रेरित कर पायेंगे।



अतिथि वक्ता डॉ दिनेश चमोला, वरिष्ठ हिंदी अधिकारी, भारतीय पेट्रोलियम संस्थान, देहरादून ने अपने अभिभाषण में हिंदी भाषा को राष्ट्र प्रेम से जोड़ते हुये कहा कि स्वतंत्रता के 65 वर्ष बाद भी हम हिंदी को वह सम्मान नहीं दे पाये जो इसे स्वतंत्रता के साथ मिल जाना चाहिए था। उन्होंने कहा कि किसी भी कार्य को करने की औपचारिकता एवं आत्मीयता में अंतर होता है हिन्दी हमारी नैसर्गिक भाषा है। हिन्दी कार्यों के प्रति हिन्दी की औपचारिकताओं को छोड़कर हमें हिंदी को आत्मीयता के साथ स्वीकार करना चाहिए तभी हम हिंदी को राष्ट्र भाषा के रूप में सम्मानित कर पायेंगे।

श्री अरुण सिंह, भारतीय मानक ब्यूरो ने इस अवसर पर कहा कि भाषा में अनुवाद का महत्व होता है इसलिए भाषा का उपयोग करते समय इसे विशेष महत्व दिया जाना चाहिए।

Patna

Orientation Programme-cum-Workshop on OMPC and Certification related matters



Standing (L-R): S K Gupta, S Lal, Vinod Kumar, Rajpal, M P Chakrabarti, D Bhadra, S K Ali, A Chatterjee, P S Mandal, K S Saha, S K Verma, B K Das, Amit Roy, N B Chakraborty, A K Maharana, D Patra, M K Rajak, Gulshan Kumar, Mohd Tausif, A K Purohit, S Basu

Sitting (L-R): J Chakraborty, A Mahmood, N Kanungo, D K Nayyar, Afzal Amanullah, K Anbarasu, S N Chatterjee, J A Siddiqui, G Roy

Orientation Programme-cum-Workshop on OMPC and Certification related matters for Eastern Region Officers was held at Patna during 14-15 June 2013.

The programme was inaugurated by Shri Afzal Amanullah, IAS and DG, BIS, Shri D K Nayyar Deputy Director General (Training Institute) (DDGTI), Shri K Anbarasu, Deputy Director General (Eastern Region) (DDGE), Shri N Kanungo, Sc-F and Head (MDK-II). Bhubaneswar (BHBO), Guwahati (GBO) and Patna (PBO) Branch Offices and Jamshedpur Inspection Office (IOJ) participated in the programme. Various topics, such as, BIS Act, Rules, Regulations, Quality Control (QC) orders,

Voluntary Registration Scheme, Simplified and Normal procedures for grant of licence, operational issues, delegation of power, laboratory related issues, handling of complaints etc. were discussed during the programme.

Ludhiana

Management System Licensees Review Meeting



Northern Regional Office (NRO) organized a Review Meeting for Management System Certification Licensees on 18 January 2013 at Guru Nanak Dev Engineering College, Ludhiana (Punjab). Smt. Parminder Bajaj, Sc-G and DDG (Enforcement), Shri K C S Bisht, and Shri Lalit Kumar Mehta, MSCD from BIS Headquarters participated in the meeting. The review meeting was attended by representative/ executive from industries and other service sector. Shri Amarjit Singh, (MSCO) welcomed all the participants/delegates on the review meeting. Shri A K Saini, Sc-G and Deputy Director General (Northern Region) (DDGN) briefed the august gathering about the programme objective. He also informed the participants about the various Management System Certification like IS/ISO 9001 : 2008, IS/ISO 14001 : 2004, IS/ISO 22000 : 2005, IS 18001 : 2007 and IS 15700 : 2005. He also requested the participants to give their experience regarding the services provided by BIS and any suggestion in a free interactive manner to have some value added services.

Smt Parminder Bajaj, Sc-G and Deputy Director General, Enforcement

Management Systems Certification (North) (DDG (Enf)) in her inaugural address elaborated the review meeting. She thanked all the licensees for getting certification licence from BIS inspite of tough competition in market from various certification bodies. She also informed that the surveillance audits are carried out to check the compliance of implementation of the system with the relevant standard on continual basis. She also requested the participants to come out freely to inform their experience of any problem faced by them.

Shri K C S Bisht, Hallmarking, BIS briefed the gathering and shared the history of this Management System Certification provided by BIS with different area of certification. He also provided the data regarding number of licensees held by BIS as well as by the different Regional Offices including overseas licensees.

A presentation was given by M/s Ambuja Cements Ltd, Darlaghat regarding various advantages they got after implementation of the Integrated Management System (IMS).

Shri Amarjit Singh, discussed the feed back received from various licensees and interacted with the licensees on the various technical points. During the meeting licensee suggested BIS to carry out such meets regularly to have a better understanding and interact between the licensee and the BIS.

फरीदाबाद

फरीदाबाद शाखा कार्यालय ने उच्च माध्यमिक स्कूल (विद्यालय) ग्राम छायासा, जिला फरीदाबाद, हरियाणा में 'उपभोक्ता जागरूकता कार्यक्रम' दिनांक 1 दिसम्बर 2012 को आयोजित किया। इस




कार्यक्रम में श्री प्रभाकर राय, निदेशक, फरीदाबाद शाखा कार्यालय ने उपस्थित लोगों को जानकारी प्रदान की, कि किस प्रकार से भारतीय मानक ब्यूरो द्वारा संचालित विभिन्न गतिविधियों के कार्यान्वयन द्वारा नागरिकों (उपभोक्ताओं) के हितों को संरक्षित किया जाता है। इस कार्यक्रम में दी गई जानकारी का संक्षिप्त विवरण निम्न है :

1) उत्पाद प्रमाणन कार्य

- 2) भारतीय मानकों का रसोई घरों में प्रयुक्त सामानों में योगदान
- 3) अनिवार्य उत्पाद मुहरांकन
- 4) शिकायत निवारण
- 5) सोने-चाँदी के जेवरों पर हॉलमार्किंग
- 6) प्रवर्तन कार्यक्रम

Marks Department Delhi-I

Based on a complaint received an enforcement raid was undertaken by a team of Marks Department Delhi-I (MDD-I) officers with the help of local police personnel from Krishna Nagar Police Station at Mr. Nitin Sethi R/o 1576, Gali No. 20, Rajgarh Colony, Krishna Nagar, Delhi on 03 July 2013.

During the visit it was observed that the firm was manufacturing Domestic Gas Stoves for use with LPG with  Mark with various brands without having valid BIS license thus violating Section 11(1) of *BIS Act 1986*. During the raid sufficient material was seized as a documentary evidence for further legal prosecution.



बीआईएस हॉलमार्क - शुद्ध सोने के जेवर की पहचान

हालमार्क आभूषण पर ये पाँच चिन्ह अवश्य देखें

मानक चिन्ह

सोने की मात्रा

परीक्षण केन्द्र का निशान

वर्ष कोड* *जुलाई 2013 में लिए गए*

आभूषण विक्रेता का निशान

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Green Ministry Lays Out Norms for Clearance and Monitoring of Forests

Industry's demand for a predictable and more structured forest clearance system could soon be a reality. An Environment Ministry Committee has recommended improvements to the forest clearance and monitoring of clearance conditions takes place.

The Committee has described 'monitoring' as the 'weakest link' in the 'entire forest clearance process'. It has provided the structure for a 'transparent, effective and unbiased' system to facilitate expeditious follow up in the event that clearance conditions have not been met. The proposed monitoring system includes self-monitoring by project proponents and the forest administration. The system also relies on third-party monitoring by the accredited institutions and experts, as well as the use of remote sensing satellite for real time data.

Besides, buttressing the monitoring mechanism, the Committee has recommended changes across the board, right from the manner of inspection of forest land under consideration for diversion, verification of reports.

To improve inspection of forests being considered for diversion, the committee has, in line with the Supreme Court order, suggested setting up site inspection Standing Committees. These will look into cases where there are doubts about project developers' claim that no forest land is being used. While there exist a detailed system scrutinising applications for forest land, there is no system of verification. The Committee has suggested using real-time satellite imagery for this purpose.

The Committee's most far-reaching suggestions are in the area of monitoring.

The proposed system requires that project developers using more than 100 hectares of forest land to prepare status reports of compliance of clearance conditions, which will have to be reviewed by the company's executive head and published both in the company's annual report and its website. The latter will allow for affected individuals, stakeholders and the public to review the company's claim. In its report on the website, the company would have to provide the measures it has taken or is taking to rectify non-compliance or partial compliance of conditions.

The company will have to submit annual compliance reports by January 31 for the preceding calendar year to the nodal officer under the Forest Conservation Act, the Deputy Conservator of Forests, the Conservator of Forests, the Principal Chief Conservator of Forests, the State Government and the regional office of the Environment Forests.

The State Government will report to the Ministry companies that have failed to undertake the self-verification exercise. The report should also provide the punitive actions it has taken or is taking against companies that have not met all the conditions set out while granting the forest clearance. The Ministry will take necessary action based on these reports.

Alongside this system of self-verification, the Committee has laid out a system, which requires the forest administration to monitor compliance. Responsibilities with timelines have been set out for the Deputy Conservator of Forests, the Conservator of Forests and Nodal Officers to monitor adherence to clearance conditions of mining activities, hydel and industrial projects during construction and post construction stage. Depending on the level of the monitoring official and the project, these

would be annual, biennial, triennial, or even once in five years.

Building in another level of checks, the Committee has suggested monitoring by the Central Government through its regional offices, third parties (accredited institutions and experts) and real time satellite data.

It has also set out a system of addressing major violations affecting flora, fauna and the environment and for minor violations. Major violations would result in suspension of clearance, while the matter is being addressed. In its compliance system, the Committee has borrowed from the system in place for violations of environmental norms and conditions.

The Committee has not addressed the issue of manpower. While monitoring of implementation of clearance conditions has been a cause of concern, the absence of manpower has been a contributory factor. The proposed system ropes in the project developer in the monitoring process. Not buttressing the existing administrative structure will upset the balance and effective render the proposed system useless. The Ministry's proposal to set new regional offices to improve functioning is yet to be cleared.

An important factor affecting forest clearances has not been worked into the system this relates to the rights of the forest dwelling population. Adherence to the Forest Rights Act is crucial for a project to be granted permission to divert forest land. While the implementation of the Forest Rights Act is the mandate of the Tribal Affairs Ministry and the Departments in the States, the Committee has not clarified how the fulfilment of this requirement will be verified while deciding on forest diversion proposals.

Economic Times
17 June 2013

Sectional Committee

TXD 09 Cordage

The fourteenth meeting of the Cordage Sectional Committee, TXD 09 was held on 25 June 2013 at New Delhi under the chairmanship of Dr R Chattopadhyay, Head of Textile Technology Department, Indian Institute of Technology, Delhi. In the meeting the Member Secretary, Shri A K Bera extended a hearty welcome to the Chairman and all the members of the Committee. The Chairman also welcomed the members and expressed his concerns over the issues relating to the cordage industry. He called upon the members to deliberate on the agenda points to arrive at consensus.

During the meeting, Draft amendment no. 2 to IS 1084 : 2005 Manila ropes – Specification and Draft Amendment No. 2 to IS 1321 (Part 1) : 2003 Sisal ropes – Specification Part 1 Untarred varieties were finalized. The draft Indian standards identical with the following ISO standards were also approved for wide circulation

ISO 1140 : 2012 Fibre Ropes – Polyamide – 3, 4, 8 and 12 strand ropes

ISO 1141 : 2012 Fibre Ropes – Polyester – 3, 4, 8 and 12 strand ropes

ISO 1346 : 2012 Fibre Ropes – Polypropylene split films, monofilament and multifilament (PP 2) and polypropylene high tenacity multifilament (PP 3) – 3, 4, 8 and 12 strand ropes

The Committee considered the draft specifications for Coir twine for trailing hop vines submitted by Central Coir Research Institute, Alleppy and decided that the same be issued in wide circulation after necessary editing by BIS, for comments. The Committee also considered the draft specification for Helideck nets submitted by Delta Ropes Manufacturing Company, Kolkata and decided that the same be issued in wide circulation. Thirteen standards were reviewed and reaffirmed in the meeting.

TXD 36 Technical Textiles for Medtech Applications

The third meeting of the Technical Textiles for Medtech Applications Sectional Committee, TXD 36 was held on 28 June 2013 at New Delhi under the chairmanship of Prof (Dr) V K Kothari of Indian Institute of Technology,

Delhi. The chairman extended a hearty welcome to the members of TXD 36. He expressed that not much progress has been done in this Sectional Committee so far but hoped that the committee will now be able to make greater progress in formulation of the specifications. He called upon the members to deliberate on the agenda points to arrive at consensus.

The Member Secretary, Shri A K Bera presented the working drafts on the following:

- a) Nonwoven gauze swab with x-ray and without x-ray detectable thread (Sterile and non-sterile),
- b) Nonwoven bandage rolls,
- c) Nonwoven laparotomy sponges with x-ray and without x-ray detectable thread (sterile and non-sterile).

The samples of the above products were also shown to the members. The Committee decided that the feedback from the users as well as test report from independent laboratories be presented for the consideration of the committee. It was also recommended that the test reports as well as the specifications should contain as many performance parameters as are essential including strength (dry as well as wet), biocompatibility test and toxicity test etc. The issue of spin finish be taken care of as well.

The following Draft Indian Standards were finalized in the meeting:

TXD 36 (1035) Medical Textiles – Surgical face masks – Specification

TXD 36 (1107) Medical Textiles – Paraffin Gauze Dressings – Specification

TXD 36 (1108) Medical Textiles – Knitted Viscose Primary Dressings – Specification

TXD 36 (1057)/ISO 20743 : 2007 Textiles – Determination of Antibacterial Activity of Antibacterial Finished Products

TXD 36 (1058)/ISO 20645 : 2004 Textile Fabrics – Determination of Antibacterial Activity – Agar Diffusing Plate Test

Three proposed draft Indian standards as given below were approved for issuing in wide circulation:

TXD 36 (1059) Part Medical Textiles – Tubular Bandages – Specification

TXD 36 (1060) Part Medical Textiles – Orthopedic Stockinette – Specification

TXD 36 (1171) Part Medical Textiles – Cast Padding for Orthopedic Plaster – Specification.

Four Indian Standards were reviewed and reaffirmed in the meeting.

TXD 12 Narrow Fabrics, Webbing and Braids

The ninth meeting of the Narrow Fabrics, Webbing and Braids Sectional Committee, TXD 12 took place on 18 July 2013 at New Delhi under the chairmanship of Shri Rajesh Srivastava of Directorate General of Quality Assurance, Ministry of Defence, Chennai. The member secretary, Shri A K Bera extended a hearty welcome to the Chairman and all the members of the committee. The Chairman also welcomed the members and expressed the importance of narrow fabrics in defence applications and reference of the Indian standards in defence specifications.

In the meeting, the committee considered the comments received on IS 5352 (Part 2 : 1999 Textiles – Glass and Glass – Polyester Fibre Woven Tapes Part 2 Method of Test and in the light of the text given in IEC 1067-2 : 1992 decided not to deviate from the international standard. The comments received on IS 9686 : 1980 Elastic tape and IS 15041 : 2001 Textiles – Flat woven webbing slings made of man-made fibres for general services were also discussed during the meeting.

TXD 13 Textile Materials for Aerospace Purposes

The ninth Meeting of Textile Materials for Aerospace Purposes Sectional Committee, TXD 13 was held on 22 July 2013 at Aerial Delivery Research and Development Establishment, Agra. Dr S C Sati, Director, ADRDE, Agra chaired the meeting. Welcoming the members, the chairman expressed his happiness over the fact that ADRDE has no parallel in the country and ranks high in the world in the field of aerospace textiles. He said, in aerospace applications we strive for light weight and higher strength materials where specifications are very much required. Inputs from manufacturers and inspection agencies play a major role as parachute is a life saving equipment where reliability should be very high.

Specifications give a very good tool to achieve reliability. He called upon the members to give inputs to amend specifications and formulate new standards. Shri A K Bera, member secretary of the committee briefed the members about the actions taken on the minutes of the last meeting.

Aerial Delivery Research and Development Establishment, Agra made a presentation on the equipments and textile materials used in aerial delivery. They also presented the views of their establishment on the comments received on the Indian Standards. In the meeting the following amendments were finalized:

- | | |
|---------------|---|
| TXD 13 (1058) | Amendment No. 2 to IS 3255 : 1979 Specification for scoured or dyed Cotton Tapes for Aerospace Purposes (<i>First Revision</i>) |
| TXD 13 (1060) | Amendment No. 3 to IS 4228 : 1979 Specification for Nylon Tapes for Aerospace Purposes (<i>First Revision</i>) |
| TXD 13 (1059) | Amendment No. 4 to IS 4726 : 1984 Specification for Light Weight Nylon Fabric for Parachutes (<i>First Revision</i>) |
| TXD 13 (1061) | Amendment No. 2 to IS 6349 : 1981 Specification for Tape, Nylon, Tubular for Aerospace Applications (<i>First Revision</i>) |

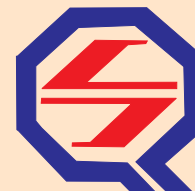
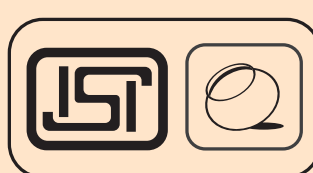
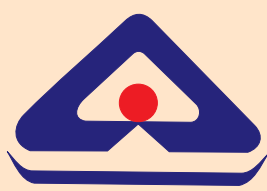
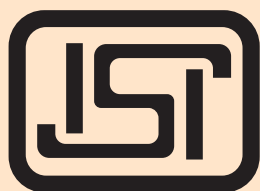
The Committee deliberated on the comments received on published Indian Standards and decided to issue draft amendments to the following Indian standards:

IS 514 : 1992 Textiles – Mercerized cotton fabrics for covering aircrafts and gliders – Specification (*Third Revision*)

IS 1402 : 1992 Textiles – Braided Cotton Cord for Aerospace Purposes – Specification

IS 4229 : 1992 Textiles – Nylon Sewing threads for Aerospace Purposes – Specification (*Second Revision*)

Fourteen Indian standards were also reaffirmed in the meeting. It was also informed by ADRDE that they would provide a draft specification on para-aramid materials for aerospace purposes for the consideration of the committee as a new subject.



नए एवं पुनरीक्षित मानक**सिविल इंजीनियरिंग**

आईएस 10 (भाग 2) : 2013 प्लाईवुड की चाय-पेटियाँ – विशिष्टि भाग 2 प्लाईवुड (छठा पुनरीक्षण), ग्रुप 4

आईएस 1126 : 2013 प्राकृतिक निर्माण-पत्थरों का टिकाउपन ज्ञात करना – परीक्षण पद्धति (दूसरा पुनरीक्षण), ग्रुप 2

आईएस 1200 (भाग 5) : 2013 भवन निर्माण और सिविल इंजीनियरिंग कार्यों की मापन पद्धतियाँ भाग 5 फॉर्मवर्क (चौथा पुनरीक्षण), ग्रुप 2

आईएस 1641 : 2013 भवनों (सामान्य) की अग्नि सुरक्षा : अग्नि श्रेणीकरण और वर्गीकरण के सामान्य सिद्धांत – रीति संहिता (दूसरा पुनरीक्षण), ग्रुप 6

आईएस 1642 : 2013 भवनों (सामान्य) की अग्नि सुरक्षा : संरचनाओं के विवरण की रीति संहिता (दूसरा पुनरीक्षण), ग्रुप 8

आईएस 1643 : 2013 भवनों (सामान्य) की अग्नि सुरक्षा : अग्नि के संपर्क में आने के खतरों – रीति संहिता (दूसरा पुनरीक्षण), ग्रुप 4

आईएस 1644 : 2013 भवनों (सामान्य) की अग्नि सुरक्षा : निकासी की आवश्यकताएँ और निजी जोखिम – रीति संहिता (दूसरा पुनरीक्षण), ग्रुप 8

आईएस 4326 : 2013 भवनों की भूकम्प प्रतिरोधी डिजाइन और संरचना – रीति संहिता (तीसरा पुनरीक्षण), ग्रुप 11

आईएस 16074 : 2013 इस्पात के सपाट दरवाजे के शटर्स – विशिष्टि, ग्रुप 7

रसायन

आईएस 5466 : 2013 चर्मशोधन वनस्पति सामग्री – परीक्षण पद्धति (पहला पुनरीक्षण), ग्रुप 6

आईएस 6199 : 2013 वैटल निष्कर्ष – विशिष्टि (पहला पुनरीक्षण), ग्रुप 3

आईएस 6301 : 2013 क्षारीय क्रोमियम सल्फेट (चर्म शोधन के लिए) – विशिष्टि (पहला पुनरीक्षण), ग्रुप 5

आईएस 6657 : 2013 खाल की छाल – विशिष्टि (पहला पुनरीक्षण), ग्रुप 2

आईएस 6658 : 2013 काजू के बीजावरण – विशिष्टि (पहला पुनरीक्षण), ग्रुप 3

NEW AND REVISED STANDARDS**Civil Engineering**

IS 10 (Part 2) : 2013 Plywood Tea-Chests – Specification Part 2 Plywood (*Sixth Revision*), Gr 4

IS 1126 : 2013 Determination of Durability of Natural Building Stones – Method of Test (*Second Revision*), Gr 2

IS 1200 (Part 5) : 2013 Method of Measurement of Building and Civil Engineering Works Part 5 Formwork (*Fourth Revision*), Gr 2

IS 1641 : 2013 Fire Safety of Buildings (General):General Principles of Fire Grading and Classification – Code of Practice (*Second Revision*), Gr 6

IS 1642 : 2013 Fire Safety of Buildings (General):Details of Construction – Code of Practice (*Second Revision*), Gr 8

IS 1643 : 2013 Fire Safety of Buildings (General) : Exposure Hazard – Code of Practice (*Second Revision*), Gr 4

IS 1644 : 2013 Fire Safety of Buildings (General) : Exit Requirements and Personal Hazard – Code of Practice (*Second Revision*), Gr 8

IS 4326 : 2013 Earthquake Resistant Design and Construction of Buildings – Code of Practice (*Third Revision*), Gr 11

IS 16074 : 2013 Steel Flush Door Shutters – Specification, Gr 7

Chemical

IS 5466 : 2013 Vegetable Tanning Materials – Methods of Test (*First Revision*), Gr 6

IS 6199 : 2013 Wattle Extract – Specification (*First Revision*), Gr 3

IS 6301 : 2013 Basic Chromium Sulphate (For Tanning) – Specification (*First Revision*), Gr 5

IS 6657 : 2013 Sal Bark – Specification (*First Revision*), Gr 2

IS 6658 : 2013 Cashew Testa – Specification (*First Revision*), Gr 3

आईएस 10286 : 2013 विरंजक सिन्टैन – विशिष्टि (तीसरा पुनरीक्षण), ग्रुप 3

आईएस 13024 : 2013 संश्लेषक चर्मशोधक सिन्टैन आपक वनस्पति चर्म द्रव – विशिष्टि (पहला पुनरीक्षण), ग्रुप 2

आईएस 13527 : 2013 स्थान पूर्ति सिन्टैन – विशिष्टि (पहला पुनरीक्षण), ग्रुप 3

आईएस 16061 (भाग 1) : 2013 आईएसओ 14687-1 : 1999 हाइड्रोजन ईंधन – उत्पाद विशिष्टि भाग 1 सड़क पर वाहनों के लिए प्रोटोन एक्सचेंज मेम्बरेन (पीईएम) ईंधन कोशिकाओं को छोड़कर सभी उपयोग के लिए, ग्रुप 7

आईएस 13271 : 2013 फिनोलिक सिन्टैन – परीक्षण पद्धति (पहला पुनरीक्षण), ग्रुप 4

आईएस 13528 : 2013 पूर्व चर्मशोधन सिन्टैन – विशिष्टि (पहला पुनरीक्षण), ग्रुप 3

आईएस 13625 : 2013 एक्रीलिक और सिन्टैन वाले पुनः चर्मशोधन सिन्टैन – विशिष्टि (पहला पुनरीक्षण), ग्रुप 3

आईएस 14194 (भाग 1) : 2013 पर्यावरण नमूनों में रेडियोन्युक्लाइड – आंकलन की पद्धतियाँ भाग 1 कुल बिटा सक्रियता मापन (पहला पुनरीक्षण), ग्रुप 2

आईएस 14194 (भाग 2) : 2013 पर्यावरण नमूनों में रेडियोन्युक्लाइड – आंकलन की पद्धतियाँ भाग 2 कुल एलफा सक्रियता मापन (पहला पुनरीक्षण), ग्रुप 2

आईएस 14194 (भाग 5) : 2013 पर्यावरण नमूनों में रेडियोन्युक्लाइड – आंकलन की पद्धतियाँ भाग 5 नमूना चयन की पद्धतियाँ, ग्रुप 3

विद्युत तकनीकी

आईएस 10322 (भाग 5/अनु 4) : 2013 प्रदीपक भाग 5 विवरणात्मक अपेक्षाएँ अनुभाग 4 सुवाहय सामान्य प्रयोजन (पहला पुनरीक्षण), ग्रुप 1

आईएस 10322 (भाग 5/अनु 5) : 2013 प्रदीपक भाग 5 विवरणात्मक अपेक्षाएँ अनुभाग 5 फलड लाइटिंग (पहला पुनरीक्षण), ग्रुप 3

आईएस 10322 (भाग 5/अनु 6) : 2013 प्रदीपक भाग 5 विवरणात्मक अपेक्षाएँ अनुभाग 6 हैंड लैम्प, ग्रुप 3

आईएस 10322 (भाग 5/अनु 7) : 2013 प्रदीपक भाग 5 विवरणात्मक अपेक्षाएँ अनुभाग 7 लाइटिंग चेन, ग्रुप 4

आईएस 10322 (भाग 5/अनु 8) : 2013 (अधिक्रमण आईएस 9583 : 1981) प्रदीपक भाग 5 विवरणात्मक अपेक्षाएँ अनुभाग 8 आपातकालीन प्रकाश-व्यवस्था, ग्रुप 6

IS 10286 : 2013 Bleaching Syntans – Specification (Third Revision), Gr 3

IS 13024 : 2013 Syntans for Prevention of Sludge Formation in Vegetable Tan Liquor – Specification (First Revision), Gr 2

IS 13527 : 2013 Replacement Syntans – Specification, (First Revision), Gr 3

IS 16061 (Part 1) : 2013 ISO 14687-1 : 1999 Hydrogen Fuel – Product Specification Part 1 All Applications except Proton Exchange Membrane (PEM) Fuel Cells for Road Vehicles, Gr 7

IS 13271 : 2013 Phenolic Syntans – Methods of Test (First Revision), Gr 4

IS 13528 : 2013 Pretanning Syntans – Specification (First Revision), Gr 3

IS 13625 : 2013 Retanning Syntans Including Acrylic and Related Syntans – Specification (First Revision), Gr 3

IS 14194 (Part 1) : 2013 Radionuclides in Environmental Samples – Methods of Estimation Part 1 Gross Beta Activity Measurement (First Revision), Gr 2

IS 14194 (Part 2) : 2013 Radionuclides in Environmental Samples – Methods of Estimation Part 2 Gross Alpha Activity Measurement (First Revision), Gr 2

IS 14194 (Part 5) : 2013 Radionuclides in Environmental Samples – Methods of Estimation Part 5 Sampling, Gr 3

Electrotechnical

IS 10322 (Part 5/Sec 4) : 2013 Luminaires Part 5 Particular Requirements Section 4 Portable General Purpose Luminaires (First Revision), Gr 1

IS 10322 (Part 5/Sec 5 : 2013 Luminaires Part 5 Particular Requirements Section 5 Floodlights (First Revision), Gr 3

IS 10322 (Part 5/Sec 6 : 2013 Luminaires Part 5 Particular Requirements Section 6 Handlamps, Gr 3

IS 10322 (Part 5/Sec 7 : 2013 Luminaires Part 5 Particular Requirements Section 7 Lighting Chains, Gr 4

IS 10322 (Part 5/Sec 8 : 2013 (Superseding IS 9583 : 1981) Luminaires Part 5 Particular Requirements Section 8 Emergency Lighting, Gr 6

आईएस 15976 : 2013 अनावृत चालक के लिए इस्पात रील और ड्रम – विशिष्टि, ग्रुप 2

विद्युत एवं दूरसंचार

आईएस/आईईसी 60793-1-44 : 2011 प्रकाशिक तंतु भाग 1 मापन विधियाँ और परीक्षण प्रक्रियाएँ अनुभाग 44 कट-ऑफ तरंग लम्बाई, ग्रुप 8

आईएस 14174 : 2013 आईएसओ/आईईसी 7813 : 2006 सूचना प्रौद्योगिकी – पहचान पत्र – वित्तीय लेनदेन कार्ड (पहला पुनरीक्षण), ग्रुप 4

खाद्य एवं कृषि

आईएस 1515 : 2013 मधुमक्खी पेटिका – विशिष्टि (चौथा पुनरीक्षण), ग्रुप 7

आईएस 1735 (भाग 2) : 2013 मधुमक्खी पेटिका का स्टैंड – विशिष्टि भाग 2 स्थिर प्रकार (दूसरा पुनरीक्षण), ग्रुप 1

आईएस 6840 : 2013 कृषि पहियेदार ट्रैक्टर के एहतियाती रखरखाव – रीति संहिता (पहला पुनरीक्षण), ग्रुप 4

आईएस 7252 : 2013 आईएसओ 2169 : 1981 फल एवं सब्जियाँ – शीत गृहों में भौतिक अवस्थाएँ – परिभाषाएँ एवं मापन (पहला पुनरीक्षण), ग्रुप 3

आईएस 8498 : 2013 टेमफोस, इम्यूलसीफियबल सांद्र (ई.सी.) – विशिष्टि (पहला पुनरीक्षण), ग्रुप 1

आईएस 9253 : 2013 कृषि कार्य हेतु पहिये वाला ट्रैक्टर – खेत में कार्य संपादन और कर्षण (ढुलाई) परीक्षण – मार्गदर्शिका (तीसरा पुनरीक्षण), ग्रुप 2

आईएस 14133 : 2013 शहद निकालने वाले व्यक्ति का किट – विशिष्टि (पहला पुनरीक्षण), ग्रुप 2

आईएस 15983 : 2013 थीयामीथोक्सम, तकनीकी – विशिष्टि, ग्रुप 2

आईएस 16118 : 2013 आईएसओ 6665 : 1983 स्ट्रॉबेरीज – शीत भंडारण की मार्गदर्शिका, ग्रुप 2

आईएस 16119 : 2013 आईएसओ 7562 : 1990 आलू – कृत्रिम रूप से संवातित भंडारों में भंडारण के मार्गदर्शी सिद्धांत, ग्रुप 2

आईएस 16120 : 2013 आईएसओ 5525 : 1986 आलू – खुले में भंडारण (ढेर में), ग्रुप 2

आईएस 16121 : 2013 आईएसओ 3402 : 1999 तंबाकू एवं तंबाकू उत्पाद – अनुकूलन एवं परीक्षण के लिए वातावरण, ग्रुप 2

आईएस 16122 : 2013 आईएसओ 7218 : 2007 खाद्य एवं पशु आहार सामग्रियों का सूक्ष्म जैवविज्ञान – सूक्ष्म जैविक परीक्षणों के लिए सामान्य अपेक्षाएँ एवं मार्गदर्शिका, ग्रुप 15

IS 15976 : 2013 Street Reels and Drums for Bare Conductors – Specification, Gr 2

Electronics and Telecommunication

IS/IEC 60793-1-44 : 2011 Optical Fibres Part 1 Measurement Methods and Test Procedures Section 44 Cut-Off Wavelength, Gr 8

IS 14174 : 2013 ISO/IEC 7813 : 2006 Information Technology – Identification Cards – Financial Transaction Cards (First Revision), Gr 4

Food and Agriculture

IS 1515 : 2013 Beehives – Specification (Fourth Revision), Gr 7

IS 1735 (Part 2) : 2013 Beehives Stand – Specification Part 2 Fixed Type (Second Revision), Gr 1

IS 6840 : 2013 Preventive Maintenance of Agricultural Wheeled Tractors - Code of Practice (First Revision), Gr 4

IS 7252 : 2013 ISO 2169 : 1981 Fruits and Vegetables – Physical Conditions in Cold Storage Definitions and Measurement (First Revision), Gr 3

IS 8498 : 2013 Temephos, Emulsifiable Concentrate (EC) – Specification (First Revision), Gr 1

IS 9253 : 2013 Agricultural Wheeled Tractors - Field Performance and Haulage Tests – Guideline (Third Revision), Gr 2

IS 14133 : 2013 Beekeeper's Kit – Specification (First Revision), Gr 2

IS 15983 : 2013 Thiamethoxam, Technical – Specification, Gr 2

IS 16118 : 2013 ISO 6665 : 1983 Strawberries – Guide to Cold Storage, Gr 2

IS 16119 : 2013 ISO 7562 : 1990 Potatoes – Guidelines For Storage in Artificially Ventilated Stores, Gr 2

IS 16120 : 2013 ISO 5525 : 1986 Potatoes – Storage in The Open (In Clamps), Gr 2

IS 16121 : 2013 ISO 3402 : 1999 Tobacco and Tobacco Products – Atmosphere for Conditioning and Testing, Gr 2

IS 16122 : 2013 ISO 7218 : 2007 Microbiology of Food and Animal Feeding stuffs – General Requirement and Guidance for Microbiological Examinations, Gr 15

आईएस/आईएसओ/टीएस 22002-1 : 2009 खाद्य सुरक्षा पर पूर्वपक्ष कार्यक्रम भाग 1 खाद्य उत्पादन, ग्रुप 8

यांत्रिक इंजीनियरिंग

आईएस 3374 : 2013 विमान नियंत्रण के लिए पूर्वरूपित इस्पात रस्सियाँ (दूसरा पुनरीक्षण), ग्रुप 5

आईएस 9798 : 2013 द्रवित पेट्रोलियम गैस (द्र. पै. गै.) मिश्रण के उपयोग के लिए अल्पदाब रेग्यूलटर – विशिष्टि (दूसरा पुनरीक्षण), ग्रुप 7

आईएस 10864 : 2013 पाइप फ्लैज और उष्मा विनिमयित्र फ्लैज के लिए धातु की जैकेटित गास्केट – विशिष्टि (पहला पुनरीक्षण), ग्रुप 3

आई एस 13152 (भाग 1) : 2013 सुवाहय ठोस बायाँ-मॉस कुकस्टोव (चूल्हा) – विशिष्टि (पहला पुनरीक्षण), ग्रुप 9

आईएस 16015 : 2013 (अधिक्रमण आईएस 2209 : 1976, आईएस 7540 : 1974 एवं आईएस 8760 : 1978) लीवर प्रणाली के मोर्टइस तालें (खड़े, सरकवाँ, दरवाजे के ताले तथा डेड लॉक) – विशिष्टि, ग्रुप 4

आईएस 16016 : 2013 पिन टम्बलर प्रणाली के बेलनाकार ताले – विशिष्टि, ग्रुप 4

आईएस 16017 : 2013 सुवाहय गैस सिलिंडर – सीवन रहित एल्युमिनियम मिश्रधातु के गैस सिलिंडरों के आवधिक निरीक्षण एवं परीक्षण, ग्रुप 10

चिकित्सा उपकरण एवं अस्पताल योजना

आईएस 16097 : 2013 निजीवाणुक एक बार उपयोग स्केल्प वेन (विंगदार सुई) इनफयूजन सेट, ग्रुप 3

प्रबंधन एवं पद्धति

आईएस 10400 : 2013 सूची नियंत्रण – पारिभाषिक शब्दावली (दूसरा पुनरीक्षण), ग्रुप 4

आईएस 16123 (भाग 1) : 2013 आईएसओ 13053-1 : 2011 प्रक्रिया सुधार में मात्रात्मक पद्धतियाँ – सिक्स सिग्मा भाग 1 डीएमएआईसी पद्धति, ग्रुप 11

आईएस 16123 (भाग 2) : 2013 आईएसओ 13053-2 : 2011 प्रक्रिया सुधार में मात्रात्मक पद्धतियाँ – सिक्स सिग्मा भाग 2 औजार एवं तकनीकें, ग्रुप 14

धातुकर्म इंजीनियरिंग

आईएस 1500 (भाग 1) : 2013 आईएसओ 6506-1 : 2005 (अधिक्रमण आईएस 1500 : 2005) धात्विक सामग्री – ब्रिनेल कठोरता परीक्षण भाग 1 परीक्षण पद्धति (चौथा पुनरीक्षण), ग्रुप 7

IS/ISO/TS 22002-1 : 2009 Prerequisite Programmes on Food Safety Part 1 Food Manufacturing, Gr 8

Mechanical Engineering

IS 3374 : 2013 Preformed Steel Wire Ropes for Aircraft Control (*Second Revision*), Gr 5

IS 9798 : 2013 Low Pressure Regulators for use with Liquefied Petroleum Gas (LPG) – Specification (*Second Revision*), Gr 7

IS 10864 : 2013 Metal Jacketed Gaskets for Pipe Flanges and Heat Exchanger Flanges – Specification (*First Revision*), Gr 3

IS 13152 (Part 1) : 2013 Portable Solid Bio-Mass Cookstove (*Chulha*) – Specification (*First Revision*), Gr 9

IS 16015 : 2013 (*Superseding IS 2209 : 1976, IS 7540 : 1974 and IS 8760 : 1978*) Mortice Locks with Lever Mechanism (Vertical Type, Sliding Door Locks and Dead Locks) – Specification, Gr 4

IS 16016 : 2013 Cylindrical Locks with Pin Tumbler Mechanism – Specification, Gr 4

IS 16017 : 2013 Transportable Gas Cylinders – Periodic Inspection and Testing of Seamless Aluminum Alloy Gas Cylinders, Gr 10

Medical Equipment and Hospital Planning

IS 16097 : 2013 Sterile Single Use Scalp Vein (Winged Needle) Infusion Set, Gr 3

Management and Systems

IS 10400 : 2013 Inventory Management – Glossary of Terms (*Second Revision*), Gr 4

IS 16123 (Part 1) : 2013 ISO 13053-1 : 2011 Quantitative Methods in Process Improvement – Six Sigma Part 1 The Dmaic Methodology, Gr 11

IS 16123 (Part 2) : 2013 ISO 13053-2 : 2011 Quantitative Methods in Process Important – Six Sigma Part 2 Tools and Techniques, Gr 14

Metallurgical Engineering

IS 1500 (Part 1) : 2013 ISO 6506-1 : 2005 (*Superseding IS 1500 : 2005*) Metallic Materials – Brinell Hardness Test Part 1 Test Method (*Fourth Revision*), Gr 7

आईएस 1500 (भाग 2) : 2013 आईएसओ 6506-2 : 2005 (अधिक्रमण आईएस 2281 : 2005) धात्विक सामग्री – ब्रिनेल कठोरता परीक्षण भाग 2 परीक्षण मशीनों के सत्यापन की पद्धति (चौथा पुनरीक्षण), ग्रुप 7

आईएस 1500 (भाग 3) : 2013 आईएसओ 6506-3 : 2005 (अधिक्रमण आईएस 4132 : 2005) धात्विक सामग्री – ब्रिनेल कठोरता परीक्षण भाग 3 परीक्षण मशीनों में उपयोग हेतु मानकीकृत ब्लॉकों के अंशशोधन की पद्धति (चौथा पुनरीक्षण), ग्रुप 5

आईएस 1500 (भाग 4) : 2013 आईएसओ 6506-4 : 2005 धात्विक सामग्री – ब्रिनेल कठोरता परीक्षण भाग 4 कठोरता माप की सारणी (चौथा पुनरीक्षण), ग्रुप 6

आईएस 1501 (भाग 1) : 2013 आईएसओ 6507-1 : 2005 (अधिक्रमण आईएस 1501 : 2002) धात्विक सामग्री – विकर्स कठोरता परीक्षण भाग 1 परीक्षण की पद्धति (चौथा पुनरीक्षण), ग्रुप 8

आईएस 1501 (भाग 2) : 2013 आईएसओ 6507-2 : 2005 (अधिक्रमण आईएस 1754 : 2002) धात्विक सामग्री – विकर्स कठोरता परीक्षण भाग 2 परीक्षण मशीनों के सत्यापन की पद्धति (चौथा पुनरीक्षण), ग्रुप 7

आईएस 1501 (भाग 3) : 2013 आईएसओ 6507-3 : 2005 (अधिक्रमण आईएस 4133 : 2002) धात्विक सामग्री – विकर्स कठोरता परीक्षण भाग 3 परीक्षण मशीनों में उपयोग हेतु मानकीकृत ब्लॉकों के अंशशोधन की पद्धति (चौथा पुनरीक्षण), ग्रुप 5

आईएस 1501 (भाग 4) : 2013 आईएसओ 6507-4 : 2005 धात्विक सामग्री – विकर्स कठोरता परीक्षण भाग 4 कठोरता माप की सारणी (चौथा पुनरीक्षण), ग्रुप 17

आईएस 6410 : 2013 चुंबकीय दोष निकालने की स्याही और पाउडर – विशिष्टि (दूसरा पुनरीक्षण), ग्रुप 6

आईएस 15987 : 2013 संघट-ईको तकनीकी का प्रयोग करके कंक्रीट संरचनाओं की अविनाशी परीक्षण हेतु – अनुशंसित रीति, ग्रुप 5

परिवहन इंजीनियरिंग

आईएस 4484 : 2013 पोतनिर्माण – विद्युत वेल्डिड स्टड कड़ी वाली एंकर जंजीरें तथा संयोजी सांकलें और पिरकियाँ – विशिष्टि (तीसरा पुनरीक्षण), ग्रुप 8

आईएस 13506 : 2013 स्वचल वाहन – संयोजन के लिये परीक्षण पद्धति (पहला पुनरीक्षण), ग्रुप 2

आईएस 14618 : 2013 स्वचल वाहन – वातानुकूलन तंत्र तापीय कार्यकारिता – मापन विधि (पहला पुनरीक्षण), ग्रुप 3

आईएस 15971 : 2013 पोतनिर्माण – अंतर्देशीय नौचालना के लिए वेल्डिड इस्पात के डमरू नौबंध – विशिष्टि, ग्रुप 4

IS 1500 (Part 2) : 2013 ISO 6506-2 : 2005 (*Superseding IS 2281 : 2005*) Metallic Materials – Brinell Hardness Test Part 2 Verification and Calibration of Testing Machines (*Fourth Revision*), Gr 7

IS 1500 (Part 3) : 2013 ISO 6506-3 : 2005 (*Superseding IS 4132 : 2005*) Metallic Materials – Brinell Hardness Test Part 3 Calibration of Reference Blocks (*Fourth Revision*), Gr 5

IS 1500 (Part 4) : 2013 ISO 6506-4 : 2005 Metallic Materials – Brinell Hardness Test Part 4 Table of Hardness Values (*Fourth Revision*), Gr 6

IS 1501 (Part 1) : 2013 ISO 6507-1 : 2005 (*Superseding IS 1501 : 2002*) Metallic Materials – Vickers Hardness Test Part 1 Test Method (*Fourth Revision*), Gr 8

IS 1501 (Part 2) : 2013 ISO 6507-2 : 2005 (*Superseding IS 1754 : 2002*) Metallic Materials – Vickers Hardness Test Part 2 Verification and Calibration of Testing Machines (*Fourth Revision*), Gr 7

IS 1501 (Part 3) : 2013 ISO 6507-3 : 2005 (*Superseding IS 4133 : 2002*) Metallic Materials – Vickers Hardness Test Part 3 Calibration of Reference Blocks (*Fourth Revision*), Gr 5

IS 1501 (Part 4) : 2013 ISO 6507-4 : 2005 Metallic Materials – Vickers Hardness Test Part 4 Tables of Hardness Values (*Fourth Revision*), Gr 17

IS 6410 : 2013 Magnetic Flaw Detection Inks and Powders – Specification (*Second Revision*), Gr 6

IS 15987 : 2013 Non-Destructive Testing of Concrete Structures Using Impact-Echo Technique – Recommended Practice, Gr 5

Transport Engineering

IS 4484 : 2013 Shipbuilding – Electrically Welded Stud Link Anchor Chains and Connecting Shackles and Swivels – Specification (*Third Revision*), Gr 8

IS 13506 : 2013 Automotive Vehicles – Method of Test for Articulation (*First Revision*), Gr 2

IS 14618 : 2013 Automotive Vehicles – Air Conditioning Systems Thermal Performance – Method of Measurement (*First Revision*), Gr 3

IS 15971 : 2013 Shipbuilding – Welded Steel Double Bollards for Inland Navigation – Specification, Gr 4

आईएस 15998 : 2013 समुद्री प्रयोग हेतु कास्ट आयरन, सिफरॉयडल/नोड्यूलर कास्ट आयरन और कास्ट स्टील, स्कू-डाउन स्टॉप वाल्व और स्टॉप और चैक वाल्व – विशिष्टि ग्रुप 4

आईएस 16043 : 2013 (अधिक्रमण आईएस 11323 एवं 11335) समुद्री प्रयोग हेतु कॉपर एलॉय, कास्ट आयरन, सफरॉयडल/नोड्यूलर कास्ट आयरन और कास्ट स्टील के फ्लेंज सहित गेट वाल्व – विशिष्टि, ग्रुप 4

आईएस 16045 : 2013 कॉपर एलॉय स्कू – समुद्री प्रयोग हेतु डाउन स्टॉप वाल्व एवं स्टॉप एवं चैक वाल्व – विशिष्टि, ग्रुप 4

आईएस 16057 : 2013 एल.पी.जी. चालित आंतरिक दहन इंजिन – सुरक्षा एवं कार्यकारिता अपेक्षाएं – विशिष्टि, ग्रुप 3

वस्त्रादि

आईएस/आईएसओ 105-ई02 : 1994 (अधिक्रमण आईएस 690 : 1988) वस्त्रादि – रंग के पक्केपन का परीक्षण भाग ई02 समुद्री पानी के प्रति रंग का पक्कापन, ग्रुप 4

आईएस 234 : 2013 (मिश्रित आईएस 10014 (भाग 2) : 1981) वस्त्रादि – वस्त्रादि रेशों के रैखिक घनत्व ज्ञात करना (भारतमक एवं वाईब्रोस्कोप विधि) – विशिष्टि (दूसरा पुनरीक्षण), ग्रुप 3

आईएस 11056 : 2013 वस्त्रादि – कपड़ों की वायु के प्रति पारगम्यता ज्ञात करने की पद्धति (पहला पुनरीक्षण), ग्रुप 3

आईएस 12171 : 2013 रूई की गाँठें – विशिष्टि (दूसरा पुनरीक्षण), ग्रुप 2

जल संसाधन

आईएस 7784 (भाग 1) : 2013 आर पार जल निकास कार्यों के डिजाइन – रीति संहिता भाग 1 सामान्य लक्षण (दूसरा पुनरीक्षण), ग्रुप 7

आईएस 9401 (भाग 6) : 2013 नदी घाटी परियोजनाओं में कार्य मापन की पद्धतियाँ (बाँध और सम्बद्ध संरचनाएँ) भाग 6 वेंटिलेशन के पाइप और अन्य सन्निहित सामग्री (पहला पुनरीक्षण), ग्रुप 1

आईएस 9401 (भाग 7) : 2013 नदी घाटी परियोजनाओं में कार्य मापन की पद्धतियाँ (बाँध और सम्बद्ध संरचनाएँ) भाग 7 जोड़ (पहला पुनरीक्षण), ग्रुप 2

आईएस 13041 : 2013 द्रव चालित हाइस्टों के निरीक्षण, परीक्षण और रख-रखाव की सिफारिशें (स्थापन के बाद) (पहला पुनरीक्षण), ग्रुप 2

आईएस 14793 : 2013 जल वैज्ञानिक संरचनाओं तथा मशीनों पर भूकंप के अलावा कंपन अध्ययनों के लिये यंत्रों का संस्थापन, अनुसरण और अवलोकन – कार्य संहिता (पहला पुनरीक्षण), ग्रुप 5

आईएस 16115 : 2013 पूर्ण हो चुकी सिंचाई परियोजनाओं (प्रमुख एवं मध्यम) का मूल्यांकन – मार्गदर्शी सिद्धांत, ग्रुप 3

IS 15998 : 2013 Cast Iron, Spheroidal/Nodular Cast Iron and Cast Steel Screw-Down Stop Valves and Stop and Check Valves for Marine Applications – Specification, Gr 4

IS 16043 : 2013 (*Superseding IS 11323 and IS 11335*) Copper Alloy, Cast Iron, Spheroidal/Nodular Cast Iron and Cast Steel Gate Valves, Flanged, for Marine Application – Specification, Gr 4

IS 16045 : 2013 Copper Alloy Screw – Down Stop Valves and Stop and Check Valves for Marine Application – Specification, Gr 4

IS 16057 : 2013 LPG Operated Internal Combustion Engine – Safety and Performance Requirements – Specification, Gr 3

Textiles

IS/ISO 105-E02 : 1994 (*Superseding IS 690 : 1988*) Textiles – Tests for Colour Fastness : Part E02 Colour Fastness to Sea Water, Gr 4

IS 234 : 2013 (*Amalgamating IS 10014 (Part 2) : 1981*) Textiles – Method for Determination of Linear Density of Textile Fibres (Gravimetric and Vibroscope Method) – Specification (*Second Revision*), Gr 3

IS 11056 : 2013 Textiles – Determination of the Permeability of Fabrics to Air (*First Revision*), Gr 3

IS 12171 : 2013 Cotton Bales – Specification (*Second Revision*), Gr 2

Water Resources

IS 7784 (Part 1) : 2013 Design of Cross Drainage Works – Code of Practice Part 1 General Features (*Second Revision*), Gr 7

IS 9401 (Part 6) : 2013 Method of Measurement of Works in River Valley Projects (Dams and Appurtenant Structures) Part 6 Ventilation Pipes and Other Embedded Materials (*First Revision*), Gr 1

IS 9401 (Part 7) : 2013 Method of Measurement of Works in River Valley Projects (Dams and Appurtenant Structures) Part 7 Joints (*First Revision*), Gr 2

IS 13041 : 2013 Recommendations for Inspection, Testing and Maintenance of Hydraulic Hoist (After Erection) (*First Revision*), Gr 2

IS 14793 : 2013 Installation, Maintenance and Observation of the Instruments for Vibration Studies Other Than Earthquakes on Hydraulic Structures and Machines – Code of Practice (*First Revision*), Gr 5

IS 16115 : 2013 Evaluation of Completed Irrigation Projects (Major and Medium) – Guidelines, Gr 3

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Relevant Indian Standards

- IS 13098** : Rubber Tubes for Automotive Tyres for Two/Three Wheelers, Passenger Cars & Commercial Vehicles
- IS 15627** : Pneumatic Tyres for Two and Three Wheelers
- IS 15633** : Pneumatic Tyres for Passenger Cars
- IS 15636** : Pneumatic Tyres for Commercial Vehicles



Bureau of Indian Standards

Manak Bhawan, 9, Bahadur Shah Zafar Marg
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Ph: 23230131, 23239402 Website: www.bis.org.in

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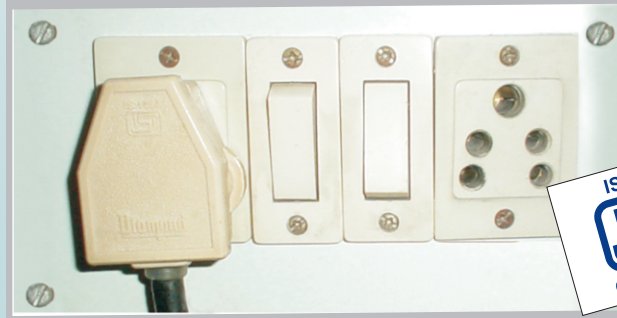
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