NATIONAL BUREAU OF STANDARDS REPORT

7585

REPORT ON INTERNATIONAL TRAVEL TO LATIN AMERICA

TO

DISCUSS, PROMOTE, ASSIST, AND PARTICIPATE

IN THE DEVELOPMENT OF PAN AMERICAN

STANDARDS FOR TEXTILES

May 17, 1962 to June 30, 1962

By
Dr. Herbert F. Schiefer
Consultant on Textiles
Polymers Division

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

THE NATIONAL BUREAU OF STANDARDS

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The functions of the National Bureau of Standards are set forth in the Act of Congress, March 3, 1901, as amended by Congress in Public Law 619, 1950. These include the development and maintenance of the national standards of measurement and the provision of means and methods for making measurements consistent with these standards; the determination of physical constants and properties of materials; the development of methods and instruments for testing materials, devices, and structures; advisory services to government agencies on scientific and technical problems; invention and development of devices to serve special needs of the Government; and the development of standard practices, codes, and specifications. The work includes basic and applied research, development, engineering, instrumentation, testing, evaluation, calibration services, and various consultation and information services. Research projects are also performed for other government agencies when the work relates to and supplements the basic program of the Bureau or when the Bureau's unique competence is required. The scope of activities is suggested by the listing of divisions and sections on the inside of the back cover.

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The results of the Bureau's research are published either in the Bureau's own series of publications or in the journals of professional and scientific societies. The Bureau itself publishes three periodicals available from the Government Printing Office: The Journal of Research, published in four separate sections, presents complete scientific and technical papers; the Technical News Bulletin presents summary and preliminary reports on work in progress; and Basic Radio Propagation Predictions provides data for determining the best frequencies to use for radio communications throughout the world. There are also five series of nonperiodical publications: Monographs, Applied Mathematics Series, Handbooks, Miscellaneous Publications, and Technical Notes.

A complete listing of the Bureau's publications can be found in National Bureau of Standards Circular 460, Publications of the National Bureau of Standards, 1901 to June 1947 ($1.25), and the Supplement to National Bureau of Standards Circular 460, July 1947 to June 1957 ($1.50), and Miscellaneous Publication 240, July 1957 to June 1960 (Includes Titles of Papers Published in Outside Journals 1950 to 1959) ($2.25); available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

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ABSTRACT

This report contains brief accounts and observations concerning textile standardization activities in the Latin American countries and concerning their interest to actively participate in the development of Pan American Standards for Textiles. Textile standards are being developed in Latin America and approximately 200 standards, written in Spanish, were obtained for study. There is interest to participate in the development of Pan American Standards for Textiles and the time is opportune to implement vigorously this activity.

SPONSOR

This activity was sponsored by the Business and Defense Services Administration, Office of Technical Services (OTS) of the United States Department of Commerce in cooperation with the American Standards Association (ASA) which represents the United States interests of both industry and governmental agencies in international standards organizations. The Pan American Standards program of ASA for development of standards for textiles is under the direction of Committee L-23 of ASA. The work of Committee L-23 is guided in technical matters by Committee D-13 on Textiles of the American Society for Testing and Materials (ASTM), the Executive Committee on Research of the American Association of Textile Chemists and Colorists (AATCC), and the National Bureau of Standards (NBS) which has been assigned the responsibility for the Federal Standard Textile Test Methods of the General Services Administration (GSA).

REPORT ON INTERNATIONAL TRAVEL TO LATIN AMERICA

To

Discuss, Promote, Assist, and Participate in the Development of Pan American Standards for Textiles.

May 17, 1962 to June 30, 1962

1. Mexico City, D. F., Mexico. May 18-21, 1962

1.1 United States Embassy.

Mr. Harry Raymond Zerbel, Second Secretary.

The aims and purposes of Pan American Standards in general and for textiles in particular were explained. Full cooperation was assured and obtained. Mr. Zerbel was especially helpful in obtaining prompt and convenient appointments.

1.2 Celanese Mexicana.

Mr. Henry Figowe, Director, Research and Development
Mr. A. H. Lynch, Director, Manufacturing
Mr. Kenneth Busch, Sub-Director General
Mr. Dennison, Chief, Quality Control
Mr. Rudolfo Lopez, Chief, Experimental Mill
Mrs. Virginia Reiz, Laboratory Supervisor

A volume of textile standards written in Spanish was obtained from Mr. Figowe. Mr. Figowe arranged meetings with key personnel of his company, a visit to the experimental mill and to the laboratories, a meeting for a lecture on high speed impact research on textiles at the National Bureau of Standards to the technical staff, a meeting with representatives of Burlington Industries, and he joined in the meeting at the Secretaria De Industria Y Comercio, where he participated in the discussions of Pan American Standards for textiles, and also served as interpreter. In addition to furnishing a volume of their textile standards a desire and interest for full cooperation and participation in the development of Pan American Standards for textiles was expressed.

1.3 Secretaria De Industria Y Comercio, Argentina Num. 12.

Lic. Felicano Garcia Ramos, Director General de Normas

Ing. Manuel Marin Gonzalez

The Pan American Standards program was discussed and full cooperation and participation was expressed in the field of textiles. Copies of Mexican standards written in Spanish were to be furnished and forwarded to Mr. Zerbel of the U. S. Embassy, and in this manner 47 textile standards were mailed to Washington, D. C.

1.4 Burlington Industries Mexicana.

Mr. Duncan Lyles
Mr. Huntington Hobbs

In the discussions the development of Pan American Standards for textiles was endorsed as very desirable and beneficial. Cooperation with Mexican efforts to attain these standards was assured. It was felt, however, that the technical assistance from Burlington could best be obtained from their United States staff and their technical representatives in South America.

2. Guatemala City, Guatemala. May 23, 1962.

2.1 Instituto Centro Americano De Investigacion Y Tecnologia Industrial (ICAITI).

Dr. Francisco Aguirre, Sub-Director General
Mr. Jean F. Hanauer, Jefe de la Secion de Textiles

The plans of ICAITI for textile processing and testing facilities were discussed. Miniature carding, drawing, and spinning machinery had just been received from the Platt Company of England. Testing instruments have been ordered from Baer Instrument Company of Zurich, Switzerland. In a tour of the laboratories the research and pilot plant facilities were observed. ICAITI has accepted participation in the Pan American Standards program, including the Secretariat for Food Standards. Although no immediate participation in Pan American Standards for textiles can be expected from

ICAITI a desire was expressed for an official invitation to the meetings for textiles with full information concerning proposed standards and the actions taken.

3. Bogota, Colombia. May 27-29, 1962.

3.1 United States Embassy.

Mr. George Albert Ellsworth, Commercial Attache.

Cooperation in the Pan American Standards program was expressed by Mr. Ellsworth, who recently assumed his assignment in Bogota.

3.2 Celanese Colombiana.

Mr. W. B. Reeson

Several textile standards written in Spanish were obtained from Mr. Reeson. Others were to be provided as soon as a current strike ceases and access to necessary files is possible. These will deal especially with definitions, identification and analyses. Copies of Spanish translations of three ASTM Standards were received in July. Contacts made with the Instituto de Normas Universidad Industrial de Santander at Bucaramango regarding the Pan American Standards program resulted in no response. Both Mr. Reeson and Mr. Ellsworth were later informed that "Consejo Nacional de Normas, Ministerio de Fomento, Bogota" was the official organization concerned with adoption of standards for Colombia, including participation in Pan American Standards activities.

3.3 Instituto de Investigaciones Tecnologicas.

Dr. Oliverio Phillips M., Director
Dr. Norton Young, Assistant Director
Dr. Felix Moncado, Chemist

The research programs of the Institute were discussed and the facilities were observed. The primary functions are concerned with chemical analyses and applied research slanted importantly toward industrial applications, including pilot plant developments and operations. In the field of textiles the main interests are concerned with cordage fibers, especially Fique. Studies are in progress for decortication, spinning, and weaving. This fiber is claimed to be stronger than sisal and expanded uses are being explored for bagging and for tufted carpet backing. Methods of evaluation, testing, and standards are needed and desired. The interests

with regard to Pan American Standards seem mainly in food processing areas. In discussing the organization officially responsible for issuing national standards it was brought out that this responsibility has been assumed by Consejo Nacional de Normas, Ministerio de Fomento, Bogota under the guidance of an Advisory Council. Dr. Phillips is a member of this council.

3.4 Laboratorio Quimico Nacional.

Dr. Jorge Ancizar-Sordo, Ex-Director

Productos Roche, S. A.

Dr. Jorge Ancizar-Sordo, Director Gerente

Laboratorio Quimico Nacional, which actively promoted standardization, including textile standards, has ceased this activity and Dr. Jorge Ancizar-Sordo, former Director, is now Director Gerente of Products Roche, S. A., concerned with pharmaceutical products.

3.5 Hanseatica, Cia. Ltda.

Hans Ullrich Mullenbach, Gerente

Brick & Tile Mfgr.

J. W. Mc Phillips, Presidente.

The restrictions placed on imported equipment and the extremely high interest rates on loans were emphasized and said to greatly impair production expansion facilities to meet urgent needs.

3.6 E. I. du Pont de Nemours & Co.

Mr. Randolph S. Young, Manager of Export

The need for textile standards in South American countries was expressed as being urgent. The names of key personnel in Lima and Montevideo, who should assist in this program, were furnished.

3.7 Coltejer-Compania Colombiana de Tejidos S. A.

Don Carlos Echevarria, Manager

The cotton textile industry in Colombia is mainly concentrated in Medellin. Unfortunately time did not permit visits in this area. Coltejer-Compania Colombiana de Tejidos S. A. is a huge South American enterprise whose plants have achieved peak performances measured according to international operations. This concern operates approximately half of the 400,000 spindles of Colombia and half of the 8,000 looms, automatic without exception, with a monthly production potential of some 14 million yards. The eight plants in Medellin proper and the affiliate firms of SEDECO and COLTEHILOS provide over half of the total needs in textile goods of Colombia. Their assistance in the Pan American Standards program for textiles is obvious and should be earnestly solicited.

4. Lima, Peru. May 29, 1962-June 8, 1962.

4.1 United States Embassy.

Mr. Frank Albert Mau, Second Secretary.

The announcement of my visit to Lima had not been received and so the purpose of my trip was unknown. Mr. Mau and his staff were extremely helpful and cooperative. In a meeting in Mr. Mau's office with key personnel from Peru the plans for the November 1962 meeting in Lima were fully discussed, a file was established, and all possible assistance was assured.

4.2 Instituto Nacional De Normas Tecnicas Industriales Y Certificacion (INANTIC).

Prof. Juan Vicente Cabrerizo, Director & Professor of Physics
Mrs. Susana de Carrillo, Chemist & Jefe de la Division Tecnica Y de Coordinacion del INANTIC
Miss Elsa Camet, Chemist
Miss Luisa Hora, Secretary

The Secretariat of Pan American Standards Committee on Textiles, CPANT C-6, has been assigned to INANTIC of Lima, Peru. The various aspects of the programs for the development of Pan American Standards for textiles were discussed in relation to North and South American national standards for textiles and also to European and ISO textile standards.

Copies of ASTM, AATCC, Federal CCC-T-191b, and ISO textile standards and other pertinent documents were given to the Secretariat in order to have a complete file for reference and consultation. Similar textile standards, obtained during this trip, were to be duplicated in Washington and forwarded to this file.

A copy of the latest proposal for ASTM D-1423 (copy appended) was discussed and suggested as a standard form for Pan American Standards. This form or one very similar to it was agreed upon as the form in which all proposals for Pan American Standards for textiles should be written prior to submittal for consideration as a Pan American Standard. This recommendation was essentially agreed to in Buenos Aires by the Provisional Secretary of CPANT.

After thorough discussions, including the urgency of developing Pan American Standards for textiles, it was agreed to schedule a general meeting in Lima, Peru, November 16-24, 1962. This date was agreed to in Buenos Aires by the Provisional Secretary of CPANT. Many other aspects essential to this Lima meeting in November, including the agenda, provisional program, operational procedures, appointments of subcommittees, arrangements, interpreters, translation, secretarial, and mimeographing services, and other details were discussed and are summarized in the minutes of meetings dated June 2 and 4. It was felt that an excellent beginning had been made and optimism prevailed in general concerning a successful meeting in November 1962 in Lima.

4.3 Peruvian Textile Mills.

Dr. George R. Schofield, Industrial Engineer

The very disappointing events that led to the discontinuance of the very excellent Textile School in Lima, Peru, were discussed with Dr. Schofield who was Director of this School. This school was established with the assistance of N. C. State College under an United States assistance contract. It acquired over $300,000 worth of modern textile processing equipment and research and testing instruments. Dr. Schofield and his professional staff of five are now associated with Peruvian Textile Mills in the Lima area. He participated in most of the discussions at Lima and frequently served as interpreter and deserves very much credit for the accomplishments attained at Lima.

4.4 E. I. Dupont de Nemours of Peru.

Mr. J. M. Hernandez, General Manager
Mr. George Anderson, Fibers
Mr. J. M. Ortiz, Dyeing & Finishing

The aims of Pan American Standards for textiles were discussed and active participation can be expected.

4.5 Acetate and Rayon Peruana.

Mr. Rudolfa Beek, Manager Rayon Plant

Although the program for Pan American Standards for textiles had not been explained before, interest in this program and assistance as well were assured.

4.6 Burlington International, S. A. Lima, Peru, S. A.

Mr. C. W. Bendigo, Director
Mr. W. H. Smith, Jr., Technology
Mr. Guillerno Isaza, Industrial Engineering

The help of Mr. Bendigo and his staff were invaluable. He helped with working out the details for the November meeting in Lima and acted as recording secretary and provided the first draft of the minutes of meetings for duplication at the U. S. Embassy. Continued interest, assistance, and participation at the November meeting were assured and will contribute immensely to the success at this meeting. Mr. Bendigo is serving as the acting head for the U. S. delegation in South America in preparation of this meeting.

4.7 Sociedad Nacional de Industrias (Comité Textil).

Edificio Francisco Pizarro, 6° Piso. Textile Industry Personnel.

Opportunity was provided in a special meeting of the Comite Textil of the Sociedad Nacional de Industrias to explain the Pan American Standards program for textiles in which Sr. Cabrerizo, Sr. Schofield, and Mr. Bendigo participated. Numerous questions were raised and discussed. Opportunity was given to give a talk on the value of textile standards, procedures for their development and revision, and also on the high velocity impact research on textiles at the National Bureau of Standards. Dr. Schofield served as the interpreter. These discussions were continued informally afterwards during cocktails and great interest for participation in this textile standards activity was generated.

4.8 Peru Textil Journal. Moquegua 270, Of 601 Lima Peru, S.A.

Mr. Augusto Elmore Hőltig, Editor.

An extended interview-discussion was had with Mr. Hőltig in which Mr. Bendigo participated and Sr. Schofield served as interpreter. The purpose of this discussion was to provide necessary background information for the Pan American Standards program for textiles in order to adequately publicize this activity in the Peru Textil Journal for the benefit of the Peruvian Textile Industry. The Editor stated that a full issue of this journal would be devoted to the November meeting in Lima and to its program and attainments.

P.S. It is a pleasure to be able to note that the 1962 June-July issue of Peru Textil contains summaries of these discussions in Lima concerning Pan American Standards for textiles and the plans of the 1962 November meetings in Lima. It also contains extensive information concerning ISO textile standards and activities. This genuine interest and cooperation is indicative of the timely opportunities for actively assisting and implementing this program.

5. Santiago, Chile.

The visits planned for Santiago unfortunately had to be cancelled on account of illness and lack of time.

6. Buenos Aires, Argentina. June 11-12, 1962.

6.1 United States Embassy.

Mr. Thomas Royd, Acting Commercial Attaché.

Mr. Royd and his staff were most cooperative and assisted generously in making appointments and in other ways to accomplish the objectives of the program for Pan American Standards for textiles which until then had not been explained.

6.2 Instituto Argentino de Racionalizacion de Materials, IRAM.

Sra. B. G. de Ciaburri, Executive Director of IRAM, and Provisional Secretary of Comité Panamericana de Normas Tecnicas (Pan American Standards Committee) CPANT.

Dr. E. V. Pineda, Division Head
Dr. P. H. Canova, Chief, Textile Standards
Dra. A. D. de Hughes, Division Head
Dr. E. I. Devereux, Interpreter & Mechanical Engineer

My visit seemed to be a surprise, although it was fully explained in my letter of May 11. (This surprise is now fully clear since my letter of May 11 was returned to me undelivered on July 19.) The discussions at Lima concerning the Pan American Standards program for textiles were reviewed and explained and pertinent documents, and minutes, were furnished to Sra. Ciaburri and her staff for study and full evaluation, and a second meeting was scheduled for the next day. A complete set of IRAM textile standards and proposed standards were received and were forwarded to Washington. In the second meeting full agreement was reached to proceed with the Lima meeting as planned in November. The proposed form for Pan American Standards was reviewed in detail and essentially complete agreement was also reached subject to the approval of the CPANT Council. It was stated that technical personnel from IRAM will work with the staff of INANTIC at Lima and also vice versa in order to closely integrate their efforts before the November meeting in Lima. It was learned regretfully that so far only the United States, Peru, Argentina, and Venezuela have indicated intentions to participate in this textile standardization program. This fact certainly seemed contrary to the enthusiastic interest exhibited during earlier visits.

6.3 Instituto Nacional de Tecnologia Agropecuaria, INTA., Tecnologia Textil Algodonera.

Dr. Julio Eduardo Caramelli, Ing. Agr.
Dra. Elena Ruth Junken, Chemist

The Cotton Technology Laboratory is a small branch of the Institute, INTA, that employes a staff of over 4,000. Neither Sr. Caramelli nor Dra. Junken were informed of the Pan American Standards program for textiles, although both were thoroughly trained in cotton fiber technology in the United States and were carrying out important functions on cotton fiber standards and evaluation in Argentina.

In view of their important potential contributions to this program Dra. Junken attended, at my insistence, the second meeting with the staff of IRAM so that in the future close cooperation may result in this work.

It was disturbing to learn that a duty, amounting in the aggregate to about 300 percent, is imposed on imported scientific testing and research instruments as well as on these instruments when manufactured by subsidiaries within Argentina. As a consequence these facilities are meager and not modern or are improvised. This may pose a serious problem in the Pan American Standards program for textiles and perhaps in other fields also.

7. Montevideo, Uruguay. June 13-15, 1962.

7.1 United States Embassy.

Mr. George Holmes Thigpen, Second Secretary
Mr. Mark, Commercial Attache

Both Mr. Thigpen and Mr. Mark showed great interest in the general Pan American Standards programs. Mr. Thigpen made a persistent effort and obtained an appointment with Mr. Douglas Huber, who is President of a large textile manufacturing plant and also President of the Textile Trade Association in Uruguay. Full cooperation in this program was assured at the Embassy and a desire was expressed to be kept fully briefed as the Pan American Standards programs develop.

7.2 Instituto Uruguay De Normas Tecnicas, UNIT.

Ing. Juan P. Molfino, Director

Although Uruguay has not indicated an intention to actively participate in the Pan American Standards program for textiles, nonetheless Sr. Molfino stated that UNIT is interested in this work. It was brought out that lack of funds prevents active participation. Further discussion indicated that essentially no textile firms are members of UNIT, although the annual membership fee is as low as $50. The hope was expressed that my contacts in Uruguay would reverse this situation. Little progress has been made concerning the establishment of a Wool Research Institute in Montevideo. Attempts to make direct contact with Prof. Fynn, Dean of the University, regarding the current status of this proposed institute were unsuccessful.

7.3 Fabrica Uruguaya de Alpargates, S. A.

Mr. Douglas Huber, President

Uruguay Textile Trade Association.

Mr. Douglas Huber, President

Mr. Huber was not acquainted with the Pan American Standards program for textiles. Although interest was shown and participation in this program should be expected, no definite commitments were promised. It was stated, however, that this matter will receive further consideration and a continued effort should be made to obtain active support.

74. Mateo Brunet, SAC, Departmento Du Pont Y Burlington Industries.

Mr. James N. Miller, President
Mr. Peter C. Lake, Gerente
Mr. Agustin A. Etcheverry

Although the need for textile standards was admitted no assurance was given to actively support and participate in the Pan American Standards program for textiles. It was learned that no laboratories exist in Uruguay where textiles can be tested and analyzed and their results and reports qualify in Court as legal evidence. This condition is astounding in view of the fact that even though cotton goods have been labelled as Dacron no expert testimony based upon fiber identification and analysis is available, and a current legal action must be decided solely on the unauthorized use of a registered Trade Name. Active participation in the work of UNIT was encouraged and this matter should be explored further with Du Pont and Burlington.

8. Sao Paulo, Brazil. June 18-20, 1962.

8.1 United States Embassy.

Mr. Herman Jelinek, Consul
Sr. Coutrin

Mr. Jelinek and his associate, Sr. Coutrin, anticipated my visit and had been previously briefed by Mr. Bendigo concerning the Pan American Standards program for textiles. The broader aspects were reviewed and full cooperation is assured. No explanation was obtained concerning the apparent non-participation of Brazil in this activity and a discussion with the staff of Associacao Brasileira De Normas Tecnicas, ABNT, in Rio de Janeiro was recommended. In view of the immense concentration of the Textile Industry in environs of Sao Paulo it was recommended that the interest and assistance of Dr. Fernando Gasparian of Sindicato da Indust Textil be solicited. Personal contact was not possible in view of the extensive celebrations in connection with the winning of the International Foot Ball Championship by Brazil for the second time. However, this recommendation should be explored, if possible, by Mr. Bendigo and Prof. Neto.

8.2 Instituto de Pesquisas Tecnologicas de Sao Paulo Y Universidade de Sao Paulo, Caixa Postal 7141.

Prof. Dr. Francisco João H. Maffei, Superintendente
Prof. Dr. Philip, Chemist
Dra. Frida Ane Maria Hoffmann, Chemist

The general program for Pan American Standards was discussed in some detail since information concerning this activity apparently had not been transmitted for study and participation. Also no explanation was available concerning the apparent non-participation of Brazil in this activity. These discussions indicated, however, that there was a great interest in and a desire to participate in all phases of the Pan American Standards programs. The reasons for an appreciation of the needs and timeliness for these activities became very apparent with the explanations of their available facilities for educational and research studies in chemistry, rubber, paper, wood and wood preservation from fungi, cement, concrete, soil mechanics, foundry, metallurgy, engineering, mechanics, electronics, radiation, microscopy, crystallography, and other specialized fields. A division is devoted to writing of specifications

and a complete set of existing specifications was obtained and transmitted to Washington for study and information. Many of these facilities were observed during a tour. This interest, desire, and competence must be enlisted in the Pan American Standards programs and visitors concerned with other phases of this program are welcome and exchange of technical information is desired. Dr. Maffei and his staff desire to be kept fully informed and also hope and expect to contribute importantly to this program.

9. Rio de Janeiro, Brazil. June 20-22, 1962.

9.1 United States Embassy.

Miss Bernice Goldstein, Consul.

The National holiday on June 21 made it necessary to schedule the meetings for June 22, however, it did provide an opportunity for a reunion and a relaxed discussion with Professor Neto on June 21 at the Hotel to plan these meetings. Prof. Neto participated the following day in the briefings and discussions at the Embassy and at ABNT and these contacts will be most beneficial as this Pan American Standards program for textiles progresses. Miss Goldstein indicated full cooperation and had arranged for a meeting with Dr. Pedroso of ABNT. She desires full information concerning this activity.

9.2 Associacao Brasileiro De Normas Tecnicas, ABNT.

Dr. Paulo Sá, Director

Instituto Nacional de Pesos e Medidas.

Dr. Luiz Alberto Palhano Pedroso, Eng. Assistente Tecnico

Prof. Neto participated in the discussions concerning Pan American Standards. The reasons for the attitude of Brazil towards this program were discussed at some length. The important contributions of Brazil to the development of textile standards were indicated and are fully understood, including a vigorous promotional and informational service through the technical press and by ABNT directly. It was agreed that ABNT would publish at an early date details concerning the general program for Pan American Standards and that Professor Neto and Dr. Araujo would prepare technical details concerning this program for textiles for publication in the following textile journals:

Brasil Textil, Cx. Postal 7087, Sao Paulo.

Revista Textil, Cx. Postal 797, Sao Paulo.

Industria Textil, Rua Mexico, 168, Rio de Janeiro.

The importance of a strong delegation from Brazil to the November meeting in Lima was stressed and full cooperation was assured to meet this need. The inability of Dr. Sá to participate in my discussions in Rio de Janeiro is very much regretted.

9.3 Escola Tecnica Federal de Industria Quimica E Textil-Senai.

Dr. Maurilio Leite de Araujo Filho, Directoria
Prof. Teodomiro Firmo da Silva Neto, Textil Engenheiro E Quality Control
Members of teaching and technical staff

The Textile School facilities consisting of a main five-story building over 500 feet in length for class rooms, laboratories, quality control testing and research plus another one-story structure of equal length with a similar unit under construction for fiber processing, spinning, weaving, knitting and finishing, were truly impressive and totally unexpected. The members of the staff, young and energetic, with recent training in the Colleges of the United States, maintain very close liaison with the Textile Industry of Brazil and with recent technology abroad through their excellent library. The current enrollment is over 150 students and is rapidly increasing from year to year. The student-faculty relationship seemed very intimate and democratic. This School is relatively new and was established and is supported by the Textile Industry of Brazil. The four year college course includes mathematics, physics, chemistry, statistics, Spanish and English in addition to courses in all fields of textile technology. It was observed that considerable processing equipment was identified as having been obtained in the United States through the Aid Program which also included training of the staff in the United States. The discussions and observations of work in progress and the available facilities indicate that emphasis is being placed on modern quality control applications. The active participation by the staff of this School in the Pan American Standards program for textiles seems necessary. The staff is interested and anxious to do so and it is likely that the necessary funds will be provided by the Textile Industry. Dr. Araujo and Prof. Neto agreed to prepare appropriate technical news items concerning this program for publication in the Textile Journals for information to the Industry and to solicit their full support.

10. Caracas, Venzuela. June 25-26, 1962.

10.1 United Nations, Ministerio de Fomento.

Dr. Victor Saxl, U. N. Textile Expert
Mr. Raymond Pierre Etchats, Resident Representative

Since frequent contacts have continued with Dr. Saxl during his two-year assignment as textile expert of the United Nations to Venezuela, it was easy to enlist his enthusiastic support in the Pan American Standards program for textiles in Venezuela. Through his extensive personal acquaintances with key people in the Government and the Textile Industry of Venezuela, he had arranged for a number of formal and informal meetings to discuss the Pan American Standards program for textiles. From the time this visit was planned to Caracas late in April, he thoroughly briefed key personnel in Industry and Government. He has worked very closely with them in the preparation of over 50 textile standards for use by the industry. Covenin has officially issued 45 standards and 8 are in process of adoption. Dr. Saxl is well qualified to participate in the Pan American Standards program for textiles and it is hoped that he can serve as a delegate to the Lima meeting in November.

10.2 United States Embassy.

Mr. Eldon J. Cassidy, Commercial Attaché.

In a discussion of the Pan American Standards program it was evident that this matter had already the full support and future cooperation is assured.

10.3 C. A. Telares De Palo Grande.

Sr. Henrique Blohm, President
Sr. Cornelio Keleti, Coordinator
Sr. Juan Gozan, Textile Engineer
Staff members

The manufacturing facilities and quality control and labeling programs were observed and explained in a visit made with Dr. Saxl. This new mill was opened in February 1961 and is modern and progressive. It is equipped with the latest processing machinery from Inglostadt, Germany and Saco Lowell of the United States. The plant was engineered by the well known firm of Lockwood Green from the United States. Key personnel are graduates from the well known Textiles Institutes at Reutlingen, Germany and Philadelphia,

Pennsylvania. The Pan American Standards program for textiles was endorsed and active participation at the Lima meeting in November can be expected by providing one or more delegates, who have been very active in the development of textile standards through Covenin.

10.4 Hilanderias Venezolanas, C. A.

Mr. José González M., Vice President

This new cotton yarn spinning plant was opened in February 1962. It is equipped with the most modern Rieter processing machinery from Winterthur, Switzerland. The testing instruments for quality control are mainly from Switzerland and with some from the United States. In the technical discussions of the facilities as well as the most modern administrative procedures Dr. Saxl participated and served as interpreter. The technical staff actively participate in the standards work of Covenin for textiles and support in the Pan American Standards program for textiles can be expected.

10.5 Comission Venzolana de Normas Industriales, COVENIN, Ministerio de Fomento.

Dr. M. Delgado Rovati, President
Dr. Parras Omana, Vice President
Dr. Carlos Pi Sunyer, Secretary
Dr. Victor Saxl, U. N. Textile Expert

The enthusiastic program for the development of standards for the industries of Venezuela were explained. Over forty percent of the standards already adopted by Covenin are in the filed of textiles. A complete set of the textile standards and copies of the Boletin of Covenin describing and promoting this standards program were obtained and transmitted to Washington for study and evaluation. This standards activity of Covenin has contributed greatly to the tremendous development of their textile industry in recent years and to the rapid increase in Venezuelan grown cotton, which is already equal to about 80 percent of current cotton consumption. Covenin will actively support and participate in the Pan American Standards program for textiles and expects to do the same in other areas of the broader program. The plan for this work will be publicized and promoted in their official publication, Boletin of Covenin.

Arrangements were made for a technical meeting with the officers and staff members of Covenin and with key technical personnel of the textile industry. It was a privilege to speak at this meeting on textile standards activities in the United States and also to give an illustrated talk concerning the research at the National Bureau of Standards on stress-strain studies of yarns at very high impact velocities. Dr. Saxl served as interpreter for these remarks and in the general and informal discussions which concluded the meeting.

10.6 Asociacion Textil Venezolana.

Henrique Blohm, President.

10.6.1 Sudamtex de Venezuela, C. A.

Ben S. Goldberg, Presidente

Celanese Venezolana, S. A.

H. Allan Wright, Gerente de Distribution

English Electric De Venezuela, C. A.

T. R. Piette, Gerente

Planificacion Agropecuaria Del Ministerio De Agricultura Y Cria.

Sr. Mauricio Baez, Director

The Asociacion Textil Venezolana arranged for a cocktail meeting which provided opportunity not only for very pleasant social conversations, but also for numerous technical discussions with many key personnel of the industry and government, and interviews by the Press. The latter served as an important and essential means of communication to publicize the Pan American Standards program for textiles in the Daily Press of Caracas and the Daily News Record of the United States.

11. Pertinent Findings and Activities.

11.1 Technical textile personnel in industry, research, testing, education, and standardization in the countries visited were not yet acquainted with the proposed Pan American Standards Program for Textiles. However, on being fully briefed this program was strongly endorsed as being timely and urgently needed and all possible cooperation was offered. It was generally felt that the degree of participation may be greatly limited owing to lack of funds, especially for travel. The technical press also indicated full cooperation in publicizing this program and its attainments.

11.2 United States Textile Standards generally were not available. Copies of textile standards of ASTM, AATCC, and CCC-T-191b, of textile commercial standards and simplified practice recommendations, of ISO textile recommendations, of textile regulatory documents, of ASA textile standards, and of miscellaneous pertinent textile documents were furnished to INANTIC, the official standards organization of Peru which has been assigned the Secretariat for Pan American Standards for Textiles. Similar copies should also be made available to the other countries for study and use.

11.3 Copies of national and industry textile standards were obtained from six countries. These standards, numbering close to 200, are written mainly in Spanish and a few in Portuguese. It is urgent that these be duplicated when not otherwise available and furnished to the other countries to study and evaluation to determine and eliminate duplication and also to adjust difference whenever possible and practicable. Many of these standards are said to correspond to United States Textile Standards. It is essential and urgent that this degree of correspondence be established.

11.4 After a number of conferences with the staff of INANTIC and Industry, a tentative program, agenda, and organizational procedures were agreed upon and a meeting was scheduled for November 16-24, 1962 in Lima, Peru, to formally discuss and initiate the adoption of Pan American Standards for Textiles. The assistance of the United States in the preparation for this meeting and full participation at this meeting is expected and much desired, and the initiative rests with U. S. technical personnel in textiles. Thus the services of competent U. S. technical personnel must be enlisted for adequate preparation prior to this meeting and a strong delegation should attend the Lima meeting to furnish guidance and leadership and to assure success at the meeting.

11.5 A preferred form for the Pan American Standards for Textiles was agreed upon. This form is illustrated by the proposed ASTM D-1423 method. This form has also been suggested to the Provisional Secretariat for Pan American Standards for use in all Pan American Standards. It was further agreed that all proposals for Pan American Standards for Textiles to be considered at the November meeting in Lima be written in accordance with the preferred form. This is essential to expedite the consideration of the technical content of each proposal and to avoid long discussions of non-technical matter.

12. Actions Recommended.

12.1 Employment of a competent textile translator, Spanish to English and English to Spanish.

12.2 To organize and appoint competent technical textile personnel as official delegates to the November meeting in Lima and to arrange for their travel. Funds for travel will be needed for delegates from Universities and other organizations which cannot pay for their travel.

12.3 In accordance with the invitation and instructions of the Secretariat, this delegation in cooperation with other textile experts is to prepare a group of textile standards in the preferred form and submit these to the Secretariat for study and consideration prior to the November meeting in Lima and for possible adoption as Pan American Standards at the Lima meeting.

12.4 To adequately and successfully carry out the recommendations prior to the Lima meeting in November 1962 the funds detailed in a Proposed Project on the Development of Pan American Standards for Textiles are required.

13. Appendix. (ASTM D-1423).

TENTATIVE METHOD OF TEST FOR TWIST IN YARNS (DIRECT-COUNTING METHOD) [1]
ASTM DESIGNATION: D 1423

Issued, 1956; Revised, 1958, 1959, 1962. [2]

This Tentative Method has been approved by the sponsoring committee and accepted by the Society in accordance with established procedures, for use pending adoption as standard. Suggestions for revisions should be addressed to the Society at 1916 Race St., Philadelphia 3, Pa.

1. SCOPE

1.1 This method gives separate procedures for determining the magnitude and direction of twist at the completion of any stage of twisting in single (spun or filament), plied, cabled, or novelty (exclusive of long-term repeat patterns) yarns. The procedures are designed primarily for yarns in packages, but, with special precautions, they are applicable to yarns from fabrics. The procedure for spun yarn in 9.2 is also applicable to rovings.

1.2 For plied yarns this method includes procedures for determining the final twist of the plied yarns and the twist of the single yarn before plying. For cabled yarns the method covers procedures for determining the final cable or hawser twist; the twist of the plied yarn after plying, but prior to the last stage of processing; and the twist of the single yarn before plying. Finally procedures are given for determining the twists of the single and plied yarn components as they lie in the final structure.

1.3 This method is not intended for yarns which, under the tension specified, extend more than 0.5 per cent. The method may be applied, however, when mutually agreeable pretensions are used.

1.4 Supplementary formulas are given for the calculation of extension and contraction on untwisting.

[1] Under the standardization procedure of the Society, this method is under the jurisdiction of the ASTM Committee D-13 on Textile Materials.

[2] Latest revision accepted by the Society at the Annual Meeting, June, 1962.

2. DEFINITIONS

2.1 Twist (Yarn), n.- The number of turns about its axis, per unit of length, existing in a yarn or cord. Twist is expressed as turns per inch (tpi) or turns per meter (tpm). The term "Final Twist" is applied to the twist counted in a straightened yarn element from a more complex structure and in which the twist of the succeeding elements has not been reinserted. For example, "Final Ply Twist" refers to the ply twist observed in a single element after the other plies have been removed and its helix has been straightened.

2.2 Twist, Direction of, n.- A yarn has S twist if, when held in a vertical position, the spirals around its central axis conform in direction of slope to the central portion of the letter "S," and Z twist if the spirals conform in direction of slope with the central portion of the letter "Z".

2.2.1 This definition applies to the twist in single yarns, the ply twist in plied yarns, and the cable or hawser twist in cords.

S Twist

Z Twist

2.3 Twist, Cable, n.- A thread, cord, or rope construction in which each successive twist is in the opposite direction to the preceding twist, that is, and S/Z/S or Z/S/Z construction.

2.4 Twist, Hawser, n.- A thread, cord, or rope construction in which the single and first ply twist are in the same direction, and the second ply twist is in the opposite direction, that is, an S/S/Z or Z/Z/S construction.

2.5 Change in Length on Untwisting.- The increase or decrease in length observed when the specimen is untwisted, expressed as the percentage extension or contraction, based on the original length of the specimen between the clamps. If an increase in length is obtained when the specimen is untwisted, this change is frequently called "Take-up."

2.6 Yarn, Spun.- Yarn spun from natural fibers, such as cotton and wool, or from man-made staple fibers, or cut waste, or blends of such fibers.

2.7 Yarn, Filament.- Yarns having two or more filaments.

2.8 For definitions of Atmosphere, Standard; Filament; Moisture Equilibrium for Testing, and other terms used in this method refer to ASTM Designation: D 123, 3/ Definitions of Terms Relating to Textile Materials.

3. PRINCIPLE; SUMMARY OF METHOD

3.1 The turns of twist in a known length of yarn are counted as they are being removed by rotating one end of the specimen with respect to the other until the elements of the yarn being tested are parallel. The number of turns required to remove the twist is reported in terms of turns per unit length.

3.2 Directions are given for the determination of the direction of twist; the amount of twist in single, plied, cabled, and novelty yarns; the change in length during untwisting (extension or contraction), and the coefficient of variation of twist in each yarn.

4. USES AND SIGNIFICANCE

4.1 The determination of twist in a straight section of a yarn is not the simple straightforward operation it appears to be, for the test results may be greatly influenced by variations in test procedures and techniques. In all manipulations, extreme care is necessary to avoid alterations of the twist.

4.2 The twist in a yarn before it is packaged may be different from that of the yarn after it has been withdrawn because of changes in tension and effects of the method of withdrawal. If the yarn is withdrawn over-end, a slight increase or decrease in twist will take place, depending upon the direction of the twist in the yarn, the direction of winding on the package, and the length of the turn (that is, wrap) on the package.

3/Appears in this publication, see Contents in Numeric Sequence of ASTM Designations at front of book.

4.3 When a yarn is incorporated into or removed from a more complex structure, alterations may occur as a result of the plying, untwisting, or raveling operation. For example, in an S-twist plied yarn composed of Z-twist single yarns, the final twist in the components is approximately equal to the difference between the plying turns per inch and that of the original single yarns. In determining the twist in the single yarn components by the conventional method, twist is reinserted in them when the plied yarn is untwisted. Consequently, the results are indicative of approximately the original twist of the elements prior to the plying operation, and not of the twist when they are functioning as components of the plied yarn. If the latter twist is desired, the test procedure must be modified. There are thus two different procedures for preparing test specimens of the component elements of a plied or cabled yarn for twist determination.

4.3.1 In the conventional procedure one end of the yarn is fixed while the other end is rotated until the structural elements are parallel and where one or all of these elements may then be tested.

4.3.2 In the alternative procedure both ends of one element of the yarn are held fixed, all the other elements are removed, the helix is straightened, and the twist is determined.

4.3.3 For convenience, results obtained by the conventional procedure are referred to as "Original Twist," and those obtained by the alternative procedure as "Final Twist."

4.4 When a yarn is taken from a more complex yarn structure or from a fabric, the resultant twist should be considered only an approximation of the original value because of alterations that may have occurred as a result of the effects of unwinding, handling, and mechanical strains met in processing.

4.5 When testing so-called "stretch" yarns, selection of an appropriate pretension to straighten the yarn is a complex problem which, for the present, must be solved by mutual agreement among all parties interested in the results of the test.

5. APPARATUS

5.1 Twist Tester. The tester shall consist of a pair of clamps, one of which is rotatable in either direction and positively connected to a revolution counter. The tester may be hand or power driven. The position of the one clamp (or both clamps) shall be adjustable to accomodate the length of test specimen specified in 8.2, and to permit measuring the extension or contraction during untwisting. Means shall be provided for pretensioning the specimen, prior to clamping, and for determining the specimen length with an accuracy of ±0.025 in. (0.5 mm). The movable but non-rotatable clamp shall be capable of being traversed with substantially no friction to permit determining the length of the untwisted specimens under the initial tension. If the Final Twist in the components of a plied or cabled yarn is to be determined, means shall be provided for removing all but one yarn element without disturbing the twist. The counting device shall be resettable and capable of recording the number of revolutions of the rotatable clamp to the following specified accuracy.

Turns of Twist in Test Specimen (tpi or tpm X Length)	Accuracy, in revolution
5 or less	0.1
From 5 to 15	0.5
Over 15	1

5.2 Dissecting Needle or Stylus.

5.3 Gage or calipers.

5.4 Means for Magnifying the Specimen, while it is clamped in the twist tester.

5.5 Equipment for Reeling Laboratory Samples Skeins, if desired.

6. SAMPLING

6.1 Take a bulk sample according to any applicable material specifications, or in their absence take a sample in such a manner that it is representative of the lot to be tested. For packaged yarns take a minimum of ten packages as the sample (Note 1). For yarns from woven or knit fabrics, the sample must be large enough to furnish a sufficient number of test specimens. Carefully identify each package or unit.

Note 1.-If desired, sample skeins may be reeled from the packages as specified in 8.1.2 taking care to have samples which are representative of the original packages.

7. CONDITIONING

7.1 For tests made as directed in 9.2 through 9.6, bring the specimens from the prevailing atmosphere to moisture equilibrium for testing in the standard atmosphere as specified in ASTM Designation: D 1776 [3], Conditioning Textiles and Textile Products for Testing.

8. TEST SPECIMENS

8.1 Selection of Specimens

8.1.1 As nearly as possible select an equal number of specimens from each package or unit of the laboratory sample. Select the specimens from each package in a random manner in order to minimize the effect of cyclic variations introduced during manufacturing processes. Take care at all times, when preparing specimens, conditioning them, or inserting them in the tester, to avoid any change in the original twist.

8.1.2 For packaged yarns take the specimens with a minimum of tension, either from the side or over-end as in normal use, if known; otherwise, take the specimens from the side of the package(Note 2). Discard the first 25 yd of yarn removed from the package. Take the specimen at random intervals greater than 1 yd along the yarn. When more than five specimens are taken from an individual package, take groups of five or less at intervals of several yards.

Note 2.-Take specimen from the center of the traverse and not at the ends of the package, where possible. Certain types of packages have a measurable variation of twist at the point of reversal of the yarn.

8.1.3 When yarns in a woven fabric are to be tested, take warp specimens from separate ends, and take filling specimens so as to represent as many bobbins as practicable. In filling-knit fabrics, select the specimen from as many different widely-separated courses as possible if it is a single-feed fabric; and from successive courses in one place if it is a multi-feed fabric (Note 3).

Note 3.-It is suggested that strips be cut from the fabric from which the test specimens can be withdrawn for test. Cut these strips so as to provide yarn specimens at least 3 in. longer than the test length and to contain more than the required number of specimen for test. If several strips are cut, divide the number of tests approximately equally among the strips.

8.2 Length of Test Specimens

8.2.1 Spun Yarns.- Take test specimens as long as convenient but somewhat less than the staple length of the fiber used to spin the yarn. The following lengths are commonly used.

Cotton-type yarn	0.5, 0.75, and 1.0 in. (10, 17.5, and 25 mm)
Woolen- or worsted-type yarns	1.0 and 2.0 in. (25 and 50 mm).

8.2.2 Filament, Plied, and Cabled Yarns, including Sewing Thread, Cord, etc.- Test length of 10. in. or 250 mm, or by agreement a length of 20 in. or 500 mm.

8.3 Number of Test Specimens

8.3.1 Unless otherwise agreed upon, take the number of test specimens required to give the precision specified in Table I. The formulas for calculation of n are also given in Table I.

Note 4.- For single spun yarns, V, the coefficient of variation of twist measured by the direct-reading method, exhibits a certain positive correlation with the coefficient-of-variation unevenness of linear density of the yarn as defined in ASTM Designation: D 1425 3/, Methods of Test for Unevenness of Textile Strands. If V is not known, it is permissible therefore to use as its estimate the coefficient-of variation unevenness of the same yarn + 2 per cent, for instance, V = 17 per cent for a yarn with a coefficient-of-variation unevenness of 15 per cent.

TABLE I. - NUMBER OF TEST SPECIMENS IF VARIABILITY IS KNOWN.

Type of Yarn	Precision	Probability Level per cent	Formula for n[a/]
Single, filament, Less than 1.0 tpi. . . .	±0.1 tpi	95	$n = 384\sigma^2$
Single, filament, 1.0 to 2.5 tpi.	±0.125 tpi	95	$n = 246\sigma^2$
All other yarns	± 5 per cent	95	$n = 0.154V^2$ (see Note 4)

a/ n= number of test specimens,
σ = standard deviation of individual test results, determined from extensive past records on similar material, and
V = coefficient of variation of individual test results, determined from extensive past records on similar material

TABLE II. - NUMBER OF TEST SPECIMENS IF VARIABILITY IS NOT KNOWN.

Type of Yarn	n	Assumed σ, tpi	Assumed V, per cent
Single, spun	100		25 (See Note 4)
Single, filament:			
less than 1.0 tpi....	15	0.20	
1.0 to 2.5 tpi.....	15	0.25	
more than 2.5 tpi....	10		8
Plied and threads.....	10		8

8.3.2 If σ or V, whichever is applicable in the formulas given in Table I, is not known, then use n as specified in Table II. The values of n in Table II have been calculated from assumed values of σ or V, also given in Table II, which are somewhat higher than will usually be found in practice. Therefore, the formulas of Table I will in most cases give a lower n than specified in Table II. To use the formulas of Table I, the σ or V applying to the yarn under test must be known.

9. PROCEDURE

9.1 General

9.1.1 Check the twist tester and make sure that the longitudinal and radial play of the clamp assemblies is low enough to produce the required accuracy. Test all conditioned specimens in the standard atmosphere for testing.

9.2 Spun Single Yarns

9.2.1 Set the movable clamp for the specimen length ±0.02 in. agreed upon in 8.2 for the yarn to be tested. Set the counter at zero.

9.2.2 Mount the specimen in the clamps under a pretension equivalent to 0.25 ± 0.05 g per tex (that is, approximately the weight of 250 m or 273 yd of yarn) (Note 5). Avoid any change in the twist while handling the yarn.

Note 5.-If yarns which extend 0.5 per cent or more under the specified load are to be tested, they must be pretensioned by the application of a load which produces an extension not greater than 0.5 per cent. The pretension used in these exceptional cases should be agreed upon by all persons interested in the test.

9.2.3 Remove the twist completely by turning the rotatable clamp until the yarn elements are parallel, as determined by visual examination, or by passing a needle or stylus between the untwisted elements from one clamp to the other.

9.2.4 Note the direction of the twist as indicated on the twist tester, or as determined by inspection of the specimen according to the definition given in 2.2.

9.2.5 Record the initial length, the direction of twist, and the number of turns in the specimen to the accuracy specified in 5.1.

9.2.6 Repeat the operation until the required number of specimens has been tested.

9.3 Filament Single Yarns

9.3.1 Set the clamps at a distance of 10 (or by agreement 20 in.) ± 0.02 in. (250 or 500 ± 0.5 mm). Set the counter at zero.

9.3.2 Mount the specimen in the clamps under a pretension equivalent to 0.25 ± 0.05 g per tex (Note 5) as described in 9.2.2.

9.3.3 Remove the twist completely and note the direction of twist as described in 9.2.3 and 9.2.4.

9.3.4 Record the initial length, the direction of twist and the number of turns in the specimen to the accuracy specified in 5.1. Record the specimen length after all twist has been removed.

9.3.5 Repeat the operation until the required number of specimens has been tested.

9.4 Plied Yarns

9.4.1 Proceed as described for single filament yarns in 9.3 to obtain the total number of turns of ply twist in the specimen.

9.4.2 Cut away all but one (Notes 6 and 7) of the strands to obtain an individual end of the single yarn. Adjust the tension to the equivalent of 0.25 ± 0.05 g per tex for the single yarn component.

Note 6.-The directions given in 9.4.2 assume that all components of the original yarn have the same direction and amount of twist. If this fact is not known, it must be verified. If any difference in kind exists, each component yarn must be tested and reported separately.

Note 7.-If the single yarns are spun yarns, additional specimens will be required. It is therefore desirable to save the cut-away strands without loss of twist for additional specimens.

9.4.3 If the single yarn is a spun yarn, proceed as described in 9.2. If it is a filament yarn, note the specimen length and proceed as described in 9.3.

9.4.4 Repeat the operations until the required number of specimens has been tested.

9.5 Cabled Yarns

9.5.1 Proceed as described for single filament yarns in 9.3 to obtain the total number of turns of hawser or cable twist in the cabled specimen and its length after untwisting.

9.5.2 Adjust the tension to the equivalent of 0.25 ± 0.10 g per tex for an individual strand of the plied yarn. Cut away all but one (Notes 6 and 7) of the strands. Note its length and proceed as described for single filament yarns in 9.3. Obtain the total number of turns of the plied yarn specimen and its length after untwisting.

9.5.3 Proceed as described in 9.2 for spun single yarns or in 9.3 for filament single yarns.

9.5.4 Repeat the operation until the required number of specimens has been tested.

9.6 Final Twist in Single and Plied Yarn Components

9.6.1 Set the movable clamp at approximately the appropriate distance for testing the component yarn. Mount the specimen in the clamp without tensioning. Cut free and remove all but one strand of the original specimen taking care not to remove any of the plied or cabled twist.

9.6.2 Proceed as described in 9.2, 9.3 or 9.4 according to the variety of component yarn to be tested.

10. CALCULATION OF RESULTS

10.1 Amount of Twist

10.1.1 Calculate the amount of twist as turns per inch (or per meter) as follows, where the length is expressed appropriately in either inches or meters.

Average twist per specimen, tpi (or tpm)

$$= \frac{\text{total number of turns observed in the specimens}}{\text{length of the specimen before untwisting}}$$

Average twist per sample

$$= \frac{\text{sum of the calculated twist in all specimens}}{\text{number of specimens}}$$

10.1.2 For plied and cabled yarns, compute the amount of twist separately for each component of the yarn.

10.2 Variability of Observations

10.2.1 Calculate the coefficient of variation of the twist using recognized statistical methods.

10.3 Extension or Contraction on Untwisting

10.3.1 Calculate the change in length during the untwisting as follows:

Extension or contraction on untwisting, %,

$$= \frac{\text{(difference between twisted and untwisted lengths) X 100}}{\text{length of twisted specimen}}$$

11. REPORT

11.1 The average single, plied, and cabled yarn twist in turns per inch or turns per meter, as appropriate, and specify if tested in accordance with 9.6.

11.2 The direction of each twist, S or Z.

11.3 The average change in length after removal of each twist (extension or contraction), in per cent.

11.4 The form of the material samples (yarn packages, warp, fabrics, etc.).

11.5 The sampling scheme used.

11.6 The length of the test specimens, in inches (or millimeters).

11.7 The pretension used.

11.8 The coefficient of variation of twist in each yarn, in per cent.

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U. S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

NATIONAL BUREAU OF STANDARDS
A. V. Astin, *Director*

THE NATIONAL BUREAU OF STANDARDS

The scope of activities of the National Bureau of Standards at its major laboratories in Washington, D.C., and Boulder, Colorado, is suggested in the following listing of the divisions and sections engaged in technical work. In general, each section carries out specialized research, development, and engineering in the field indicated by its title. A brief description of the activities, and of the resultant publications, appears on the inside of the front cover.

WASHINGTON, D. C.

Electricity. Resistance and Reactance. Electrochemistry. Electrical Instruments. Magnetic Measurements. Dielectrics. High Voltage.

Metrology. Photometry and Colorimetry. Refractometry. Photographic Research. Length. Engineering Metrology. Mass and Scale. Volumetry and Densimetry.

Heat. Temperature Physics. Heat Measurements. Cryogenic Physics. Equation of State. Statistical Physics.

Radiation Physics. X-ray. Radioactivity. Radiation Theory. High Energy Radiation. Radiological Equipment. Nucleonic Instrumentation. Neutron Physics.

Analytical and Inorganic Chemistry. Pure Substances. Spectrochemistry. Solution Chemistry. Standard Reference Materials. Applied Analytical Research. Crystal Chemistry.

Mechanics. Sound. Pressure and Vacuum. Fluid Mechanics. Engineering Mechanics. Rheology. Combustion Controls.

Polymers. Macromolecules: Synthesis and Structure. Polymer Chemistry. Polymer Physics. Polymer Characterization. Polymer Evaluation and Testing. Applied Polymer Standards and Research. Dental Research.

Metallurgy. Engineering Metallurgy. Microscopy and Diffraction. Metal Reactions. Metal Physics. Electrolysis and Metal Deposition.

Inorganic Solids. Engineering Ceramics. Glass. Solid State Chemistry. Crystal Growth. Physical Properties. Crystallography.

Building Research. Structural Engineering. Fire Research. Mechanical Systems. Organic Building Materials. Codes and Safety Standards. Heat Transfer. Inorganic Building Materials. Metallic Building Materials.

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Data Processing Systems. Components and Techniques. Computer Technology. Measurements Automation. Engineering Applications. Systems Analysis.

Atomic Physics. Spectroscopy. Infrared Spectroscopy. Solid State Physics. Electron Physics. Atomic Physics.

Instrumentation. Engineering Electronics. Electron Devices. Electronic Instrumentation. Mechanical Instruments. Basic Instrumentation.

Physical Chemistry. Thermochemistry. Surface Chemistry. Organic Chemistry. Molecular Spectroscopy. Molecular Kinetics. Mass Spectrometry.

Office of Weights and Measures.

BOULDER, COLO.

Cryogenic Engineering Laboratory. Cryogenic Equipment. Cryogenic Processes. Properties of Materials. Cryogenic Technical Services.

CENTRAL RADIO PROPAGATION LABORATORY

Ionosphere Research and Propagation. Low Frequency and Very Low Frequency Research. Ionosphere Research. Prediction Services. Sun-Earth Relationships. Field Engineering. Radio Warning Services. Vertical Soundings Research.

Radio Propagation Engineering. Data Reduction Instrumentation. Radio Noise. Tropospheric Measurements. Tropospheric Analysis. Propagation-Terrain Effects. Radio-Meteorology. Lower Atmosphere Physics.

Radio Systems. Applied Electromagnetic Theory. High Frequency and Very High Frequency Research. Modulation Research. Antenna Research. Navigation Systems.

Upper Atmosphere and Space Physics. Upper Atmosphere and Plasma Physics. Ionosphere and Exosphere Scatter. Airglow and Aurora. Ionospheric Radio Astronomy.

RADIO STANDARDS LABORATORY

Radio Physics. Radio Broadcast Service. Radio and Microwave Materials. Atomic Frequency and Time-Interval Standards. Millimeter-Wave Research.

Circuit Standards. High Frequency Electrical Standards. Microwave Circuit Standards. Electronic Calibration Center.


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