BUSINESS PLAN

ISO/TC 1
Screw threads

EXECUTIVE SUMMARY

1 INTRODUCTION

1.1 ISO technical committees and business planning

The extension of formal business planning to ISO Technical Committees (ISO/TCs) is an important measure which forms part of a major review of business. The aim is to align the ISO work programme with expressed business environment needs and trends and to allow ISO/TCs to prioritize among different projects, to identify the benefits expected from the availability of International Standards, and to ensure adequate resources for projects throughout their development.

1.2 International standardization and the role of ISO

The foremost aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade.

Three bodies are responsible for the planning, development and adoption of International Standards: ISO (International Organization for Standardization) is responsible for all sectors excluding Electrotechnical, which is the responsibility of IEC (International Electrotechnical Committee), and most of the Telecommunications Technologies, which are largely the responsibility of ITU (International Telecommunication Union).

ISO is a legal association, the members of which are the National Standards Bodies (NSBs) of some 140 countries (organizations representing social and economic interests at the international level), supported by a Central Secretariat based in Geneva, Switzerland.

The principal deliverable of ISO is the International Standard.

An International Standard embodies the essential principles of global openness and transparency, consensus and technical coherence. These are safeguarded through its development in an ISO Technical Committee (ISO/TC), representative of all interested parties, supported by a public comment phase (the ISO Technical Enquiry). ISO and its Technical Committees are also able to offer the ISO Technical Specification (ISO/TS), the ISO Public Available Specification (ISO/PAS) and the ISO Technical Report (ISO/TR) as solutions to market needs. These ISO products represent lower levels of consensus and have therefore not the same status as an International Standard.

ISO offers also the International Workshop Agreement (IWA) as a deliverable which aims to bridge the gap between the activities of consortia and the formal process of standardization represented by ISO and its national members. An important distinction is that the IWA is developed by ISO workshops and fora, comprising only participants with direct interest, and so it is not accorded the status of an International Standard.

2 BUSINESS ENVIRONMENT OF THE ISO/TC

2.1 Description of the Business Environment

The following political, economic, technical, regulatory, legal and social dynamics describe the business environment of the industry sector, products, materials, disciplines or practices related to the scope of this ISO/TC, and they may significantly influence how the relevant standards development processes are conducted and the content of the resulting standards:

Screw threads have two big advantages. One is that they connect parts together, which means that designers and manufacturers can design and make highly complicated machines and equipments, thereby extending the very ability to manufacture. The other is that they can be disassembled, with the result that worn or damaged components can be replaced more easily, extending the life of the machines and equipment and reducing the costs associated with their use and maintenance. For these reasons alone and because they are the basic element of manufacturing industry, screw threads are widely used across almost every branch of industry -- which is why the ISO Technical Committee responsible for them received the number “one” when the numbers of TCs were being handed out! There are standardization committees for screw threads or fasteners and screw threads in most industrialized nations. During World War II, for instance, the US Department of Defence directly oversaw the standardization of screw threads, establishing the general ASA war committee on screw threads and in the process clearly illustrating the vital **importance** of screw thread standardization, in both war and peace.

To produce screw threads, **several branches** of industry have evolved to serve their production: providing threading taps, thread rolling or cutting dies, thread rolling machines, tapping machines, thread gauges, thread inspection equipments, calibrating laboratories of thread gauges, thread rolling monitors, adhesives and coating, among others. **Some branches** of industry produce particular types of screw threads in large quantities: fasteners, valves, lead screws, fittings, and so on.

With the increase in global production and trade, ISO’s International Standards for screw threads have become increasingly **important**. Firstly, engineers around the world need to be able to identify screw threads correctly. There are about 500 screw threads in existence, and it is not always easy to distinguish among them! Secondly, engineers want unified basic dimensions and tolerances for screw threads, as well as the ability to check them in a uniform manner. Finally, engineers would like to see all screw thread standards conceived and set out in the same way or using a similar system of technology – or at least to use the same vocabulary and symbols in relation to screw threads. Only ISO’s International Standards fulfil these wants and needs. At the present time, many industrialized countries have adopted, or in the process of adopting, ISO International Standards on screw threads as their national standards. But there are just 18 of these International Standards, covering only three kinds of screw thread and including a vocabulary of terms related to cylinder screw threads. For other types such as miniature and buttress screw threads there are no International Standards at all. Because of this shortage, engineers have the right to expect ISO/TC 1 to work actively and achieve goals on their behalf as soon as possible. At least a basic drafting platform, with a unified vocabulary, symbols,

designation and technical system, should be built up by ISO/TC 1. Other TCs could then use this platform as a basis for drafting their own International Standards for special screw threads. Then, it would not only be simpler for users to understand the requirements of those special screw threads, but the number of different kinds of screw thread in the world could be kept to minimum. However, at present, there are not enough International Standards even to cover the terms and symbols applying to most kinds of screw threads. See Table 1 for special screw thread standards drafted by other ISO/IEC TCs and Table 2 for the screw threads not yet included in ISO standards.

The International Standards on screw threads usually include terms and definitions, symbols, profiles, combination of diameters and pitches, basic dimensions, tolerances and designations, gauges and gauging, etc. Without some of these basic elements for particular types, the standards cannot be used. For example, there are no International Standards covering the basic dimensions and gauges of UN screw threads. This limits the use of International Standards.

To enable existing ISO International Standards on screw threads to play their maximum and vital role, it is first necessary to revise and supplement those that already exist. This is the current mission of ISO/TC 1. See the objectives of ISO/TC 1, first phase in 5.1.

Since each country realizes that International Standards on screw threads have a great influence on their entire industry and competitiveness in international market, it usually insists that those standards be adopted as its national standard as far as possible. So it is extremely difficult to obtain agreement from most P-member countries and takes a very long time to prepare an ISO screw thread standard. The history of ISO/TC 1 shows this. It was a tough period. This situation has to be changed. Otherwise, ISO/TC 1 will go into standby condition once again.

According to the demand of world market, ISO/TC 1 shall decide which screw thread standards ought to be drafted, and the order of importance and urgency they should be accorded. It is the working principle of ISO/TC1.

The more modern assembly lines and electronic products that are used, the greater precision and miniature screw threads that are needed. At the same time, as the connection reliability of screw threads becomes increasingly important, the user needs more and more reliable methods to gauge screw threads, calculate their strength and lock their joints. So **the development trends** in the field are more accuracy and miniaturization; more reliable gauging, strength and locking. These are the bases for the long-term work of ISO/TC 1. See the objectives of ISO/TC 1, second phase in 5.1.

Table 1 – International standards related to special screw threads drafted by other TCs

Types of screw threads	TC/SC	International Standard(s)
Tapping screw threads (ST)	ISO/TC 2	ISO 1478:1999
Pressure-tight pipe threads (R)	ISO/TC 5/SC 5	ISO 7-1:1994; ISO 7-2:2000 (gauges)
No pressure-tight pipe threads (G)		ISO 228-1:2000; ISO 228-2:1987 (gauges)
Aerospace inch threads (UNJ)	ISO/TC 20/SC 4	ISO 3161:1999; ISO 15872:2002 (gauges)
Aerospace metric threads (MJ)		ISO 5855-1:1999; ISO 5855-2:1999; ISO 5855-3:1999; ISO 10959:2000 (gauges)
Tyre valve threads (V)	ISO/TC 31/SC 9	ISO 4570:2002
Gas cylinder threads (E, M)	ISO/TC 58/SC 2	ISO 10920:1997; ISO 11116-1:1999; ISO 11116-2:1999 (gauges) ISO 11191:1997 (gauges) ISO 15245-1:2001; ISO 15245-2:2001 (gauges)
Threads on rotary shouldered connections (NC, REG, FH, IF)	ISO/TC 67/SC 4	ISO/DIS 10424-2 (threads and gauges)
Casing, tubing and line pipe threads (CSG, LP, TBG)	ISO/TC 67/SC 5	ISO 10422:1993; (threads and gauges) ISO/CD 15464 (gauging recommendation)
Rock drilling – Left hand reverse-buttress threads and left-hand rope threads	ISO/TC 82	ISO 1721:1974; ISO 1722:1974; ISO 10208:1991
Cycles -- Screw threads	ISO/TC 149	ISO 6696:1989; ISO 6698:1989; ISO 8488:1986
Metal bone screws and plates - asymmetrical threads (HA, HB)	ISO/TC 150/ SC 5	ISO 5835:1991;
Microscopes -- Screw threads (RMS, M)	ISO/TC 172/ SC 5	ISO 8038-1:1997; ISO 8038-2:2001; ISO 11882:1997

Table 1-- (continued)

Types of screw threads	TC/SC	International Standard(s)
Threads for electrical conduits and fittings (M)	IEC/TC 23A	IEC 423:1993 (threads and gauges)
Threads for lampholders	IEC/TC 34B	IEC 60238:2004 (threads and gauges) (M, G) IEC 60399:2004 (threads and gauges)

Table 2 -- Screw threads not yet covered by International Standard

Types of screw threads	National standards
Miniature screw threads [1)]	ASME B1.10M:2004; BS 4827:1972 (AMD published 1976); DIN 14-1, -2, -3, -4:1987; GB/T 15054.1, .2, .3, .4, .5:1994; GOST 9150, 8724:2002 [2)]; GOST 9000:1981; GOST 3199:1984 (gauges); JIS B0201:1973; NF E03-501, -502, -503, -504:1970; NIHS 06-02, -05:1970 (Switzerland) There are the national standards of miniature screw threads in 22 countries. They all came from the standards of Switzerland, NIHS.
Metric threads with transition fit	DIN 13-51:1988; GB/T 1167:1996; GOST 24834:1981
Metric threads with interference fit	DIN 8141-1:1993 (The Interference fit takes place on the major diameter); DIN 8141-2:1993 (gauges); GB/T 1181:1998 (The Interference fit takes place on the pitch diameter); GOST 4608:1981 (The Interference fit takes place on the pitch diameter).
Metric extra-fine pitch threads (Instrument industry)	JB/T 9313:1999 (China); GOST 16967, 24706:1981;
Metric taper threads (60º)	DIN 158-1:1997; DIN 158-2:1997 (gauges); GB/T 1415:1992; GOST 25229:1982; GOST 24475:1980 (gauges) There are the national standards of metric taper threads in 12 countries.

Table 2 -- (continued)

Types of screw threads	National standards
Inch trapezoidal threads (ACME,29º)	ASME B 1.5:1997; BS 1104:1957; BS 919 -5 (gauges) There are the national standards of ACME threads in 5 countries.
Metric buttress threads (3º/30º)	DIN 513-1, -2, -3:1985; DIN 20401:2004 GB/T 13576.1, .2, .3, .4:1992; GOST 10177, 25096:1982; GOST 10278:1981 (gauges); GOST 17381:1984 (gauges) There are the national standards of metric buttress threads in 12 countries.
The basic or assistant standards for screw threads, such as	
-- The designation of screw threads;	JIS B 0123:1999 Designation system;
-- The gauging system of screw threads;	ASME B 1.3M:1992 The gauging system of UN, UNR, UNJ, M, MJ threads;
-- Screw thread measuring cylinders;	BS 3777:1964, BS 5590:1978 cylinders; JB/T 3326:1999 cylinder (China); JIS B 0271:2004 measuring wires; ASME B 89.1.17:2001 Measureing wires; SS 1744:1988 Gauging with wires;
-- The measurement of screw threads;	XP E03-110:2003 Direct measuring methods (France); JIS B 0261:2004 Parallel screw thread gauges -- Measuring method of gauges; JIS B 0262:1989 Inspection method for taper screw gauges; ASME B1.20.5:1991 (Appendix B) Measurment of pitch diameter of taper threads;

1) The International Standard on miniature screw threads, ISO/R 1501:1970, was withdrawn in 1998.
2) GOST 9150 and GOST 8724 specify the profile and general plan of metric general purpose screw threads and miniature screw threads.

2.2 Quantitative Indicators of the Business Environment

The following list of quantitative indicators describes the business environment in order to provide adequate information to support actions of the ISO/TC:

The market size for each screw thread is almost impossible to evaluate due to its vastness. The absolute fundamental nature of screw threads makes them a born prerequisite for the specification of most products within the mechanical engineering disciplines. To estimate the market value of threading tools, threading machines, thread gauges and measuring equipments, etc, is very complex too.

The world demand for screw thread products is mainly concentrated in three continents: Asia, North America and Europe. In 2004, the market shares of Asia, North America and Europe were about 33%, 32% and 30% respectively.

Note: World demand for screw thread products is estimated on the basis of information on fasteners. Threaded fasteners are typical of large quantity production.

There are many kinds of screw threads produced in large quantities, including the M, UN, BSW/BSF, Tr/ACME and G/R/NPT screw thread types. See Table 3 for the market shares of each kind screw thread.

Table 3 -- The market shares of each screw thread

Region	Fastening Threads 93%			Traversing threads 1%	Pipe Threads [5] 6%	
	M	UN	BSW, BSF	Tr and ACME [4]	G, R	NPT
Asia [1]	81%	9%	3%	1%	3%	3%
North America [2]	15%	77%	1%	1%	1%	5%
Europe [2]	85%	5%	3%	1%	5%	1%
World [3]	60%	31%	2%	1%	3%	3%

1) The market shares of Asia mainly come from the data of China. By investigating the quantity of threading taps used to cut different kinds of screw threads, the market shares of each screw thread were estimated in China.
2) By reference of the data of Asia and the conference of CEN/TC 185 held in 2003, the market shares of North America and Europe were estimated. In UK, the market share of UN screw threads was about 45%.
3) For each screw thread

   WORLD % = (ASIA % ×33 + AMERICA % ×32 + EUROPE % ×30) / (33+32+30).

   The values of 33, 32 and 30 come from the market shares of three continents respectively.
4) The market shares of metric trapezoidal screw threads (Tr) and inch trapezoidal screw threads (ACME) are about 0.67% and 0.33% respectively.
5) The standards of pipe threads are not in the working scope of ISO/TC 1. They are the standards of ISO/TC 5/SC 5.

3 BENEFITS EXPECTED FROM THE WORK OF THE ISO/TC

Implementation of ISO/TC1 standards:

- reduces costs;
- assures quality;
- shortens the time from design concept to market product, and
- provides communication and reduces the risk of misinterpretation.

4 REPRESENTATION AND PARTICIPATION IN THE ISO/TC

4.1 Countries/ISO members bodies that are P and O members of the ISO committee

4.2 Analysis of the participation

There are 13 P-members and 22 O-members. Among the P-members, nine (69.2%) are from Europe, two (15.4%) from Asia, one (7.7%) from North America and one (7.7%) from Africa. European countries are the decisive force of ISO/TC 1.

The market share proportion between Asia, North America and Europe is about 1:1:1. While the P-member proportion between Asia, North America and Europe is 2:1:9. There is a big difference between the two proportions. Sometimes voting in ISO/TC 1 cannot reflect the real market demand of screw threads, with the result that the ISO standard system of inch screw threads cannot be set up. For example, there are no International Standards for gauges and basic dimensions of UN threads, and no International Standards for inch trapezoidal threads (ACME). The way to improve this situation is to establish a working principle and strategy for ISO/TC 1. The working principle ought to be the promotion of international trade and the international trade situation ought to decide the working program of ISO/TC 1. The strategy ought to be designed to make the work of ISO/TC 1 more efficient and successful. See the strategy of ISO/TC 1 in 5.2.

Present among the P members of ISO/TC 1 are countries that invented the oldest and most widely used screw threads, the former ISO/TC 1 secretariat country and nations with a significant fastener industry, including the UK, USA, France, Sweden, Germany, Japan and China. The participants in the screw thread committees are drawn mainly from the manufacturers of fasteners, thread gauges, threading tools, cars, airplanes, etc.

5 OBJECTIVES OF THE ISO/TC AND STRATEGIES FOR THEIR ACHIEVEMENT

5.1 Defined objectives of the ISO/TC

The objectives of ISO/TC 1 can be divided into **two main phases:** the improvement of existing standards and the development of emerging needs.

In the **first phase**, the work program should follow two principle paths:

1) **Permanent updating** and **supplementing** of the existing standards so that they reflect current economic and industrial life, in order to facilitate trade between manufacturers and users. See Table 4.
2) Drafting of the standard for miniature screw thread. The profile and tolerances of it are the same for most countries**.** See Table 2. Its priority for the preparation of this standard is high.

There are 12 International Standards to be dealt with in the first phase.
The order of priority for the revision or preparation of standards is in three levels, high, normal and low.

Table 4 – Updating and supplementing of the existing standards

International Standards and actions	Reason and reference standards	Priority
Metric general purpose screw threads(**M**): 1) ISO 68-1:1998 (Revision) Delete the first paragraph in clause 4. 2) ISO 965-1:1998 (Revision) -- add the tolerances of multi-start thread; -- add the designation for coating threads. 3) ISO 1502:1996 (gauges)(Revision) Add the length values of gauges.	Design profile is the starting line of fundamental deviation, not basic profile. DIN 13-52:1999 Tolerances; After coating & Before coating. The axial length of gauges would affect the results of gauging.	1) Low 2) Low Low 3) Low
Metric trapezoidal screw threads (**Tr**): 1) ISO 2901:1993 (Revision) Add the section of design profile. 2) Add the standard of gauges (New Item).	One design profile replaces the two maximum profiles. DIN 103-9:1985 (gauges); GB/T 8124:2004 (gauges); NF E03-619, -620, -621:1997 (gauges).	1) Low 2) Normal
Unified inch screw threads (**UN, UNR**): 1) ISO 68-2:1998 (Revision) Add the section of design profile; 2) Add or reinstate the standard of basic dimensions[1)] (New Item) 3) ISO 5864:1993 (Revision) Update the data of tolerances; 4) Add the standard of limits of sizes (New Item); 5) Add the standard of gauges (New Item)	ASME B 1.1:2003; ASME B 1.2:1983 (gauges); BS 1580-1, -2:1962; BS 1580-3:1965; BS 919-1:1960, BS 919-4:1964 (gauges); JIS B 0206, 0208, 0210, 0212:1973; JIS B 0255:1998 (gauges); NF ISO 68-2, 263, 725, 5864**:**2004. There are the national standards of unified screw threads in 19 countries.	1) Low 2) High 3) Low 4) Low 5) Normal
Screw threads – **Vocabulary** ISO 5408:1983 (Revision) Extend the content to include the terms of taper threads and buttress threads, and the terms used in checking or gauging screw threads.	ASME B 1.7M:1984; GB/T 14791:1993; GOST 11708:1982; JIS B 0101:1994; NF E03-000:1985 The terms of DIN and BS are only suitable to cylinder screw threads.	High
1) The ISO standard of basic dimensions, ISO 725:1978, was withdrawn in 2000.		

In the **second phase**, the existing and emerging areas needing attention are the following. Each item's priority for the preparation of standard is in the parenthesis.

a. Metric taper threads (Low);

b. ACME threads (Low);

c. Metric buttress threads (Low);

d. Metric threads with transition fit (Low);

e. Metric threads with interference fit (Low);

f. Metric extra-fine pitch threads (Low);

g. Basic or "assistant" standards for screw threads, including

-- The designation of screw threads (Low);
-- The gauging system of screw threads (High);
-- Screw thread measuring cylinders (High);
-- The measurement of screw threads (High);

See Table 2 for details. There are about 30 International Standards to be dealt with in the second phase.

5.2 Identified strategies to achieve the ISO/TC's defined objectives

ISO/TC 1 has determined that the planning of new standards and the revision of standards are to be based on the following:

- The documents are to be drafted and their priority determined according to the world demand for each screw thread. At present, the metric and inch screw threads are used in international trade. Both kinds of screw threads are needed. It is impossible to allow all inch screw threads go out of use at once. Without International Standards for inch screw threads, they will be kept for use according to national standards, such as those of ASME and BS, which is most inconvenient for the user. International Standards should be allowed to play their important role in promoting international trade.
- Metric general-purpose screw threads are used in largest quantities. To extend their scope of application, miniature screw threads, metric threads with transition fit, metric threads with interference fit, metric extra-fine pitch threads and metric taper threads should be introduced. These screw threads form a big family of metric threads.
- The vocabulary of terms used in relation to screw threads is very important and will be promptly revised, as it is the basis for unifying the technical system and requirements and simplifying the structure of International Standards in this field.
- Establish a system of screw threads and know the goal of ISO/TC1's works. The system should include all standards for screw threads and satisfy all needs of thread production. See Figure 1 in the annex.
- The documents to include the specification of profile(s), diameter and pitch combinations, basic dimensions, tolerances and designation, gauges and gauging. These are the five basic aspects of screw threads, which form a comprehensive whole. The absence of attention to any one of these will adversely affect the use of a document.
- For some large screw threads having many diameter and pitch combinations, those with a variety of tolerances, and which are used in larger quantities, the five basic aspects are to be covered in five International Standards or five parts of a standard respectively. This will make it easier to revise and refers to a particular aspect individually in the future.
- For screw threads used in larger quantities, it would be well to add sections on limits of size, measuring cylinders, etc, which would enable designers to choose and produce the screw threads more easily.
- Refer to existing national standards as much as possible during the preparation of an International Standard.
- Before New Items are applied for, they are discussed with the members from the European countries. Europe is a decisive force in ISO/TC 1 and many ISO standards are directly adopted as European national standards.

- If a New Work Item is very advanced and useful, and is not well known to most members, publish it in the first place as a technical specification. Let most members have enough time to get to know it.
- For each New Work Item, establish a special Working Group to prepare the document.
- The chairman and secretary of the technical committee manage the works of the technical committee, and supervise and help the works of Working Group. There is no subcommittee in ISO/TC 1 since it is believed that a complicated structure would not be helpful at present.
  Note: All active subcommittees of ISO/TC1 (SC1, SC2 and SC4) were disbanded in 2000.

6 FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE ISO/TC WORK PROGRAMME

It is considered that the known and possible major risks for the timely completion of the work programme consist of the following (in un-prioritized order).

- The extreme fundamental nature of screw threads. If a new International Standard is different from the national standard of a country, that country will incur enormous expense in adopting the International Standard. Due to the lack of consistent international standardization in the past, there has developed a wide disparity between different national standards. This makes the work of harmonization very difficult and the time to draft an International Standard long.
- Differing interests. Each industry and regional standard-developing organization has its own business interests. For example, some European countries do not use inch screw threads. While the North America uses the inch screw threads in large quantities.

7 STRUCTURE, CURRENT PROJECTS AND PUBLICATIONS OF THE ISO/TC

This section gives an overview of the ISO/TC's structure, scopes of the ISO/TCs and any existing subcommittees and information on existing and planned standardization projects, publication of the ISO/TC and its subcommittees.

7.1 Structure of the ISO committee

7.2 Current projects of the ISO technical committee and its subcommittees

7.3 Publications of the ISO technical committee and its subcommittees

Reference information

Glossary of terms and abbreviations used in ISO/TC Business Plans

General information on the principles of ISO's technical work

ANNEX

THE SYSTEM OF SCREW THREADS IN USE TODAY

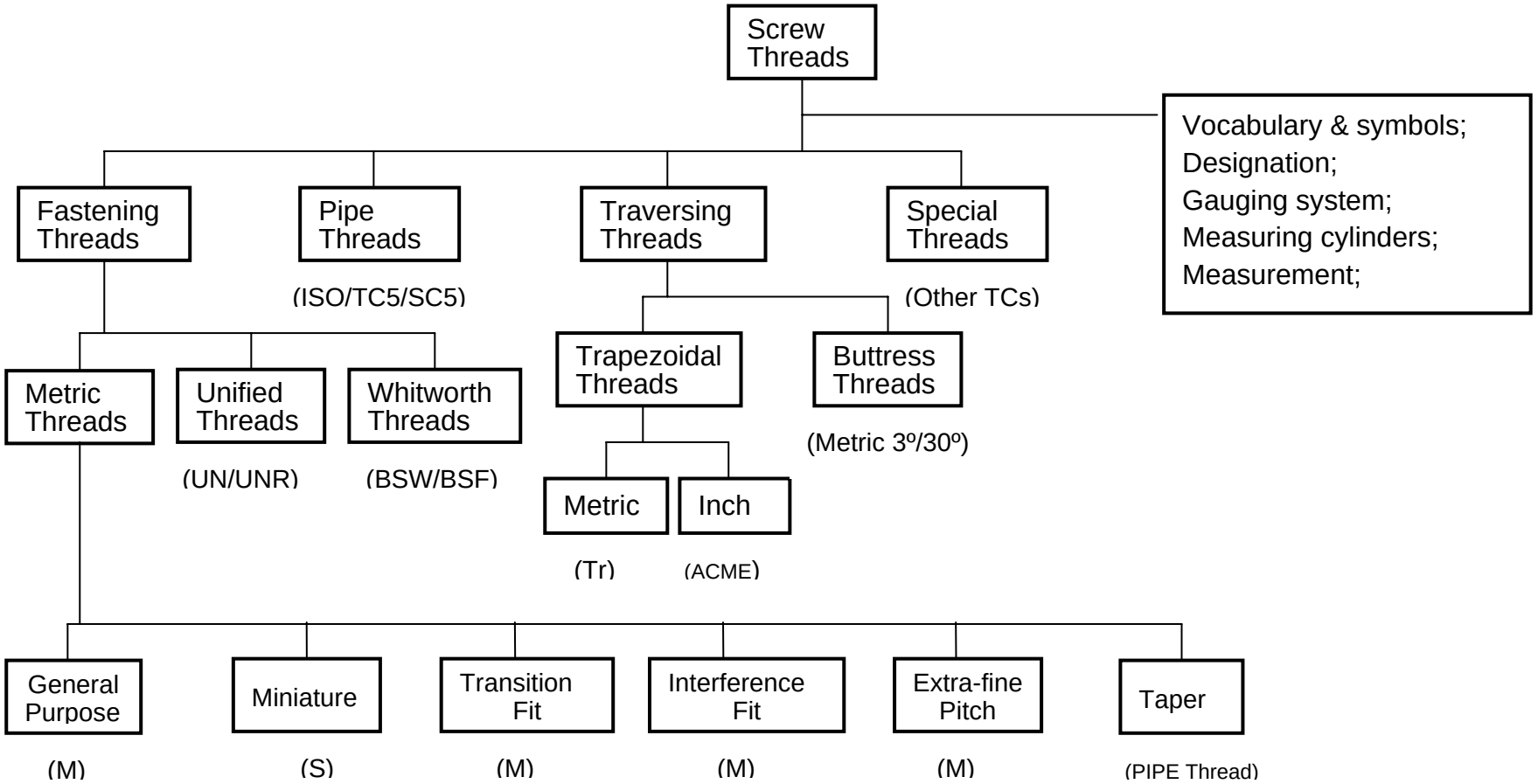

Figure 1 – The system of screw threads in use today