BUSINESS PLAN

ISO/TC 199
Safety of machinery

EXECUTIVE SUMMARY

The main activity of ISO/TC 199 is standardisation of general principles for safety of machinery incorporating terminology and methodology.

The main parties involved in the work are the industry (manufacturer, designer), Health and Safety Government Bodies, National Boards of Occupational Health and Safety, Public authorities, National Trade Union Confederations, National Employer's Associations, ILO International Labour Organization and WHO World Health Organization.

There are several benefits already realized or expected through the availability of International documents published by this Technical Committee, e.g.:

- to allow product standards to be developed within ISO and IEC that are based on an internationally accepted approach.
- to provide designers, manufacturers, etc. with an overall framework and guidance to enable them to produce machinery etc. which is safe for the intended use for occupational and private purposes.
- to help manufacturers to construct machines complying with essential safety and health requirements consistent with national regulations.
- to allow a wide range of interests such as consumer groups and employee representatives to take part in the future development of the philosophy and methodology.
- to contribute towards the development of an international machinery market through the abolition of technical barriers to trade.
- to reduce the risks of injury at work and also at home and during leisure activities.
- to contribute towards the achievement of equal levels of performance in the various countries for each safety aspect dealt with in an International Document.
- to promote a constructive dialogue between the developed and developing countries.
- to facilitate relations between manufacturers, users, and bodies in charge of technical inspection and testing.
- to promote the risk-based approach to machinery design.

The main objectives and priorities in the work of the committee are to elaborate International Documents[1] related to:

- basic concepts and general principles for design of machinery;
- principles for risk assessment and risk reduction;
- fundamental safety issues regarding e.g. safety distances, whole body access, two-hand controls, emergency stops, interlocking devices and guards;
- hygiene requirements for the design of machinery.

[1] e.g. International Standards, Technical Specifications, Technical Reports or Guides

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 also offers 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 International Standards development processes are conducted and the content of the resulting documents:

The increased use of machinery is one of the key stages in the development of any country and there is now a wide spectrum of use from the mature societies in the developed world to those in the emerging nations. Today, machines are used for both professional use in such key sectors as metal and wood working, plastics and paper, construction, agriculture and forestry as well as non-professional use in the home and garden. Indeed, a growing trend is the migration of machines intended for professional use into the non-professional sector.

The trade in both new and used machinery can be described as truly global with an increasing trend for multinational companies to manufacture in one continent for use around the world. In contrast, there is also a continuing growth in the manufacture and repair of machines in small and medium enterprises (SMEs) and it has been estimated that 90% of employed persons work in SMEs.

However, whilst the intensity and range of use can vary from country to country and industry to industry, the risks from the use of an individual machine are the same - or at least similar - wherever it is used. It is therefore logical to expect that there should be the possibility of developing a common approach - a common philosophy and methodology - to reducing the risks arising from the use of machinery that could be applied anywhere in the world.

National laws and regulations dealing with the safety of machinery have developed in parallel with the increased use of machines in response to societie's needs to have the benefits from the machines without the consequential costs from the risks that machines generate. Individual countries have developed their own approaches to machinery safety legislation and many of these sometimes conflicting approaches have in effect been seen to be, or are barriers to a truly global trade in machines. Manufacturers have - and are still having - to produce machines with different protective measures to gain access to different markets.

These legal barriers to trade were first recognised within the European Economic Community (EEC now the European Union - EU) as the member countries prepared for the Single Market and moves were introduced to harmonise machinery legislation. During this work it was realised that one of the major obstacles to this harmonisation was the lack of a common philosophy and methodology to obtain the practical realisation of the legal objectives. Individual countries had developed prescriptive solutions to individual problems as they arose and some regulations had been virtually unchanged for 150 years.

CEN/TC 114 "Safety of Machinery“ was established in 1985 and the experts within the Working Groups developed a methodology based on the identification of hazards and the reduction or elimination of the consequential risk.

The philosophy is based on the principles of risk reduction and the methodology is based on the development and use of a structure of basic (type-A-) and group (type-B-) standards which, when used together, give the designer all the information necessary to carry out a risk assessment and to reduce the risks to the desired level.

The key elements of this approach are:

- to identify the hazards associated with machinery including those posed by the physical environment; and
- to achieve acceptable levels of safety (adequately reduced risks) for machines following the basic approach to be used in the assessment of all risks to health and safety for any machine during all stages of the machine's life cycle from assembly to scrapping, under conditions of foreseeable use and misuse.

The strategy gives the following approach:

- identify all hazards to health and safety;
- carry out a risk assessment and on the basis of the risk assessment, eliminate or minimise the risk by:
    - inherently safe design,
    - safeguarding and and complementary risk reduction measures,
    - provision of information on residual risks and any precautions needed to deal with them;
- achieve good levels of performance.

In 1990, it was decided by some European Members of ISO that the approach developed within CEN could be transferred to the international arena of ISO in order to promote safety and health sensitisation and to reduce technical barriers to trade worldwide. It was also foreseen that world wide exposure of this approach would allow the philosophy and the methodology to develop further. This significant step resulted in the formation of ISO/TC 199 which had its first meeting in 1991.

From the very beginning it was a basic principle of the work of ISO/TC 199 that it should be done in co-operation with the providers of safety standards within ISO and in particular, IEC.

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:

It is impossible to quantify in any accurate way the total value of the global trade in machinery because the scope of ISO/TC 199 covers all the machinery produced for both professional and non-professional use including domestic and leisure purposes. These quantifications should be left to the various machinery sectors. However, as an example the annual trade in machine tools is estimated to be on the order of $ 100 million.

Accidents involving machines regrettably occur wherever they are used. They can be high profile accidents involving multiple deaths on public transport or the everyday accidents around the house. Every accident involving a machine during professional, domestic or leisure use can result in the affected person being in pain and possibly with short- or even long-term health effects. In addition, it can cause varying degrees of inconvenience and costs to the individual and possibly the individual's family and to the society through the cost of nursing, supporting the affected family and through the costs of remedial measures. Also and apart from these direct costs of accidents, there is an important loss to economy due to production interruption and property damage. It is estimated that these indirect costs account for two to five times the direct costs of accidents.

It is not possible to calculate the total cost of every machinery accident in the world but recent studies have shown that for a single accident, the total cost to the individual and to society can be as much as $1m. Clearly any measure that can reduce the number of accidents will result in a saving in pain and injury to the individual and the overall costs to society.

ISO/TC 199`s objective is that it contributes directly to the reduction of all machinery accidents by defining the methodology and philosophy for reducing the risks for all hazards and all machines. The direct result of this work is that if the methodology is followed by the designer of machinery, there will be a related reduction in machinery accidents and hence the consequential reduction in pain and suffering to the individual and overall costs to society.

3 BENEFITS EXPECTED FROM THE WORK OF THE ISO/TC

The work within ISO/TC 199 fully meets the approach developed in ISO/IEC Guide 51:2014 *"Safety aspects – Guidelines for their inclusion in standards"*.

ISO 12100 lays down the general principles for design of machinery as well as risk assessment and risk reduction strategies. This International Standard has become the first truly global standard for machinery safety. There are other standards dealing with a wide range of other fundamental safety issues, e.g.:

- Safety distances to prevent hazard zones being reached by the upper and the lower limbs,
- Minimum gaps to avoid crushing of parts of the human body,
- The positioning of protective equipment in respect of the approach of the human body,
- General principles for the design and validation of safety-related parts of control systems,
- Functional aspects and design principles for two-hand control devices,
- General principles for the design and testing of pressure-sensitive protective devices,
- Functional aspects and principles for the design of emergency stop equipment,
- General requirements for the design and construction of fixed and movable guards,
- Principles and specifications for the reduction of risks to health from hazardous substances emitted by machinery,
- Permanent means of access to machinery,
- Hygiene requirements for the design of machinery,
- The reduction of risks arising from noise and vibration,
- The integration of ergonomic principles into the design process.

Some group (type-B-) standards are being developed by IEC/TC 44 "Safety of machinery – Electrotechnical aspects", ISO/TC 43 "Acoustics", ISO/TC 108 "Mechanical vibration and shock" and ISO/TC 159 "Ergonomics".

The use of a common philosophy and methodology that can be used for any machine and for any risk or combination of risks will

(a) allow product (type-C-) standards to be developed within ISO and IEC that are based on an internationally accepted approach.

(b) provide designers, manufacturers, etc. with an overall framework and guidance to enable them to produce machinery etc. which is safe for the intended use for occupational and private purposes.

(c) help manufacturers to construct machines complying with essential safety and health requirements consistent with national regulations.

(d) allow a wide range of interests, such as consumer groups and employee representatives, to take part in the future development of the philosophy and methodology.

(e) contribute towards the development of an international machinery market through the abolition of technical barriers to trade.

(f) reduce the risks of injury at work and also at home and during leisure activities.

(g) contribute towards the achievement of equal levels of performance in the various countries for each safety aspect dealt with in a standard.

(h) Promote a constructive dialogue between the developed and developing countries.

(i) Facilitate relations between manufacturers, users, and bodies in charge of technical inspection and testing.

(j) Promote the risk-based approach to machinery design.

This approach gives special benefits for SMEs which possibly do not have the resources to develop their own approach to many sophisticated areas of technology. They can also use the standards with the confidence that they are using the methodology that has been developed by the world's leading experts in the given technology.

This approach also supports the protocols signed between the World Trade Organisation and ISO in promoting freedom of trade in the global context.

4 REPRESENTATION AND PARTICIPATION IN THE ISO/TC

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

4.2 Analysis of the participation

In total, 51 ISO members are members of ISO/TC 199 whereby 26 of them are P-members and 25 of them are O-members.

Category A-Liaisons have been established with Consumers International (CI) and the European Trade Union Institute (ETUI).

There is an imbalance of participation between developed countries and developing countries and countries with economies in transition.

Reasons could be

- lack of interested parties in the field of safety of machinery (e.g. machine manufacturers),
- lack of experts,
- travelling costs,
- lack of information,
- lack of awareness of the work of ISO/TC 199.

It seems also that the educational role of the horizontal standards of ISO/TC 199 do not have the rating which is suitable to bring the standardization work nearer to future experts.

In order to improve this situation, workshops could be initiated for information, transmission of know-how and exchange of experiences.

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

5.1 Defined objectives of the ISO/TC

In view of the above considerations, ISO/TC 199 considers that International Standards related to Safety of Machinery should:

a) be revised or amended at a rate that aligns with the swift evolution of technology, particularly in the fields of artificial intelligence and cybersecurity;

b) rely, as clearly as possible, on the most recent technical knowledge available, and in particular on recognized technical literature (e.g. ISO, IEC, CEN, CENELEC standards, national standards, professional literature);

c) be prepared in co-operation with all concerned bodies, such as manufacturers, users, employees' representatives, accident prevention organizations, inspection bodies, competent technical bodies, consumer groups;

d) prescribe results rather than means in order to enable technical progress.

In the meantime, ISO/TC 199 has revised most of its standards at least once in co-operation with CEN/TC 114 under the Vienna Agreement (ISO lead). This revision activity is still ongoing. In addition, co-operational projects have been carried out successfully with other Technical Committees of ISO and IEC, e.g. with

— ISO/TC 159/SC 1 *General ergonomics principles* -> ISO/TR 22100-3 on practical application of ergonomics to machinery;

— IEC/TC 44 *Safety of machinery - Electrotechnical aspects* -> ISO 13850.

During this work, the following aspects have to be taken into account:

- Retain the co-operation and goodwill of the organisations and experts.
- Recruit experts and gain support from organisations of all regions worldwide in order to allow all stakeholders involved in safety of machinery to participate.
- Capture the best experts to lead the Working Groups and to ensure that they are properly resourced and supported.
- Plan and execute the work in the most efficient way taking full advantage of modern technology and management practices.
- Be responsive to the needs of organisations new to standardisation.
- Take account of emerging technology and the demands of the global market.
- Reconcile the different approaches to legal practices both national and regional.

The same approach will be used to identify and complete standardization in areas that are new to ISO/TC 199. The ISO/TC 199 needs to take into account IT security through relevant liaison with other TC and/or specific topics addressed under ISO/TC 199 responsibility. Specifically, the work program should be fully compatible with IEC/TC 44 who deals with several standards in the same scope than ISO/TC 199.

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

In accordance with ISO/IEC Guide 51 *"Safety aspects – Guidelines for their inclusion in standards"* the main aim of work of ISO/TC 199 is to develop basic and group machinery safety standards. ISO/TC 199 recognizes that there are limited resources to undertake this work. To minimize the impact on these limited resources, ISO/TC 199 will endeavour to utilize work already completed and to encourage members of the committee to transfer national and regional efforts in this area to ISO wherever possible.

The technical work is managed by the Technical Committee, which is supported by a Special TC Advisory Group (jointly with CEN/TC 114), and its Working Groups, which are currently as follows:

WG 2 *"Hygiene requirements for the design of machinery"*

WG 3 *"Safety of integrated manufacturing systems"*

WG 5 *"General principles for the design of machinery and risk assessment"*

WG 6 *"Safety distances and ergonomic aspects"*

WG 7 *"Interlocking devices"*

WG 8 *"Safe control systems"*

WG 10 *"Fire prevention and protection"*

WG 11 *"Permanent means of access to machinery"*

WG 12 *"Human-machine interactions"*

WG 1 "Basic principles, methodology, terminology", and WG 4 "Information for use" were disbanded in September 2006. Beyond, WG 9 "Pressure-sensitive protective devices" was disbanded in April 2014. In November 2015 JWG 1 "Merging of ISO 13849-1 and IEC 62061" (Joint WG with IEC/TC 44) was set dormant.

WG 2 "Hygiene requirements for the design of machinery" has been re-established in December 2023.

Liaisons and cooperations with other Technical Committees/Subcommittees

ISO/TC 10 "Technical product documentation"
ISO/TC 23/SC 13 "Powered lawn and garden equipment"
ISO/TC 39/SC 10 "Machine tools - Safety"
ISO/TC 43/SC 1 "Noise"
ISO/TC 72/SC 8 "Safety requirements for textile machinery"
ISO/TC 82 "Mining"
ISO/TC 96 "Cranes"
ISO/TC 110/SC 2 "Safety of powered industrial trucks"
ISO/TC 110/SC 4 "Rough-terrain trucks"
ISO/TC 127 "Earth-moving machinery"
ISO/TC 131 "Fluid power systems"
ISO/TC 159 "Ergonomics"
ISO/TC 159/SC 1 "General ergonomics principles"
ISO/TC 159/SC 3 "Anthropometry and biomechanics"
ISO/TC 159/SC 4 "Ergonomics of human-system interaction"
ISO/TC 178 "Lifts, escalators, passenger conveyors"
ISO/TC 184/SC 1 "Physical device control"
ISO/TC 192 "Gas turbines"
ISO/TC 195 "Building construction machinery and equipment"
ISO/TC 270 "Plastics and rubber machines"
ISO/TC 293 "Feed machinery"
ISO/TC 299 "Robotics"
ISO/TC 306 "Foundry machinery"

ISO/TC 313 “Packaging machines”
IEC/TC 44 "Safety of machinery – Electrotechnical aspects"
IEC/TC 56 "Dependability"
IEC/TC 65 “Industrial-process measurement, control and automation”
IEC/TC 94 “Electrical relays”
IEC/TC 116 " Safety of hand-held motor-operated electric tools"
ISO/IEC JTC 1/SC 27 “Information security, cybersecurity and privacy protection”

CEN/TC 114 "Safety of machinery"

CI "Consumers International"

To work as effective as possible ISO/TC 199 and its WGs makes use of electronic means of communication and by using the possibility of conducting also web meetings or hybrid meetings as alternative to pure face-to-face meetings.

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

ISO/TC 199 is currently improving the coherence of its standards. Considering the diversified structure of the machinery industry, this process is a time-consuming challenge. To be successful in this process, ISO/TC 199 needs to persuade experts representing different sectors of the machinery industry in an appropriate way.

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