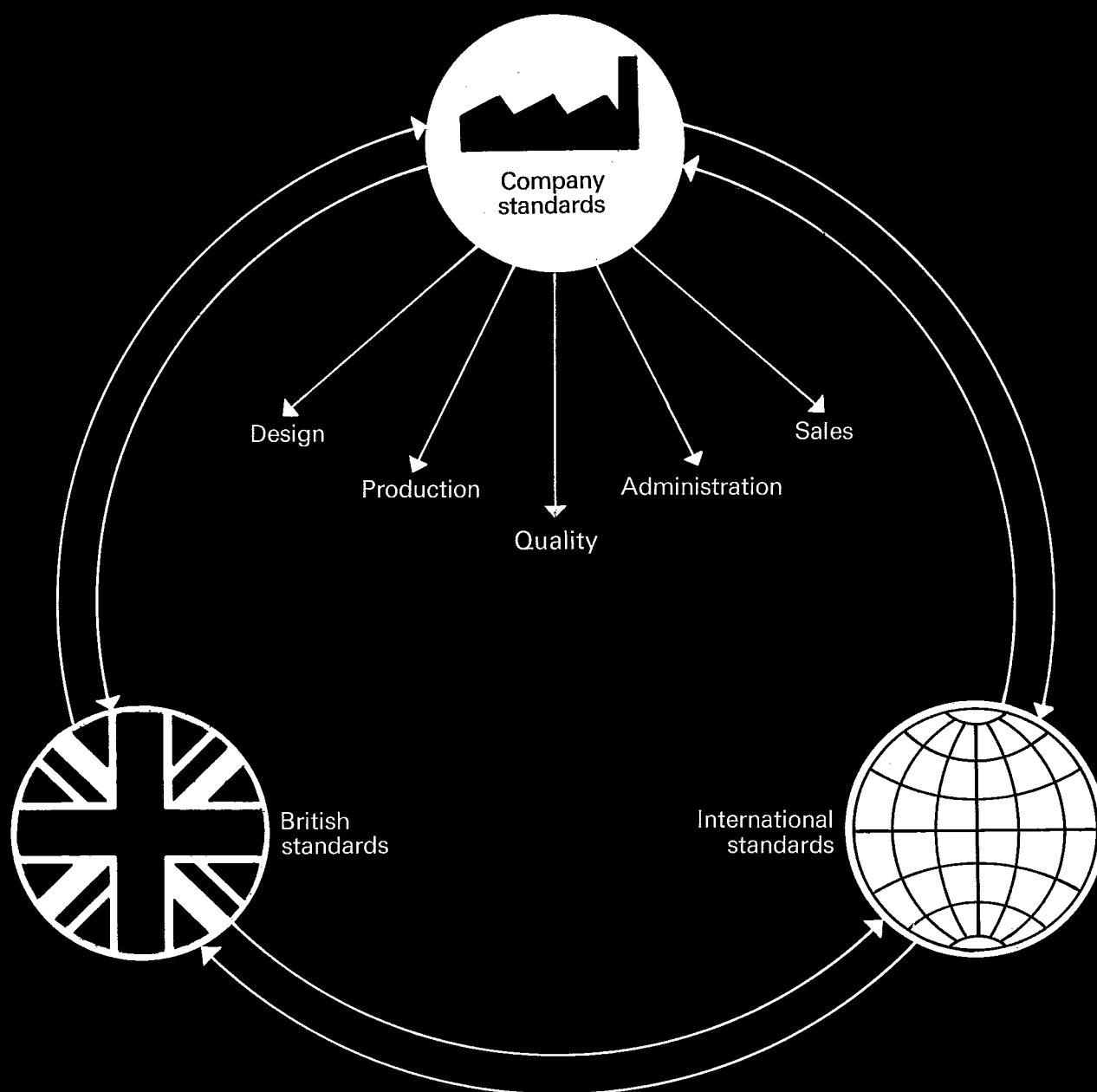


The operation of standards in a company



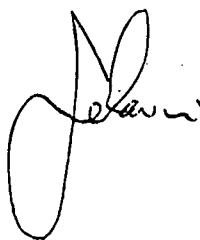
Foreword

It is nine years since this publication was updated. It then had the title 'The operation of a company standards department'. Since then there has been increasing emphasis on the need for improved quality assurance to increase the competitiveness of British industry. Quality assurance depends on standards; in many firms the quality department also has responsibility for standards and its functions include those described here. The functions remain, but to avoid apparently restricting companies to one form of management when there are many viable alternatives, the title has been changed to 'The operation of standards in a company'.

The text has been updated to take account of new developments and in particular the guidance on quality activity has been amplified. However the appendices on international standardization have been omitted as the information they contained is now given in PD 6515 IFAN-Guide 2. Company use of international standards, published in 1986. The clauses have been renumbered to improve clarity.

The importance of standards, both international and national, in helping companies in their day to day operations has increased as standards have come to contain information on more and more subjects. Good standards procedures are essential if exporting companies are to be competitive and indeed if their goods are to be allowed into some countries at all. There have also been developments in the areas of health and safety, of consumer protection and in regard to the EEC Directive on Product Liability. The sensible use of standards provides a necessary safeguard in these areas. This publication contains a great deal of information for those responsible for the standards function in a company.

The British Standards Society provides a forum for those who are concerned with the technique of applying standards widely and efficiently. Over the years many members of the Society have contributed to this publication and a small special working group has been responsible for this updating. I hope it will provide a good basis and useful information for anyone who is concerned with the use of standards in any way.



J M L GAVIN
Chairman, British Standards Society

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Section one. General

1.1 Introduction

This publication provides guidelines for the requirements, responsibilities and contribution of a company standards function. It is intended for the individual introducing standards into his company, as well as for the manager who wishes to consolidate the organization of an established standards function.

Like quality, standards are everybody's business and they are of use in all aspects of a company or organization. Standardization is essentially a management technique and may be applied in part by anyone with management responsibility or as a whole by specialists employed for the purpose.

This publication was first issued in 1959. Twenty years' experience proved the basic principles described in the first edition, and the need for a more comprehensive and detailed guide to company standardization practice was then recognized. The experiences of members of the British Standards Society, including experience coming from members through their association with the work of the International Federation for the Application of Standards (IFAN) was combined to produce the second edition in 1979.

This third revision brings the previous edition up to date and takes account of developments, particularly in information and quality assurance. It is written in terms of *company standards* and the work of the *standards team*. Many people engaged in standards work are not engineers, because standardization can be applied to all functions in an organization, whether it be a private company, a nationalized industry, or one of the Services. The functions covered include, for example, design, manufacture, accounting, administration and buying. There is no doubt that a good standards organization is of great benefit to the company and this includes meticulous care of documentation.

The term 'standards engineer' is used throughout to describe all people employed in company standardization regardless of their local titles.

NOTE. The titles of the publications referred to in this document are listed on the inside back cover.

1.2 Definitions

For the purposes of this publication, the following definitions apply.

1.2.1 catalogue. A published list of information on equipment, parts or materials. Presented primarily for the retrieval of information, it usually incorporates the code, and sufficient information for the user to identify his requirements. (e.g., the user may be the designer, the storeman, the buyer, the inspector or the customer. Everyone is both a 'user' and 'a supplier' at some stage.)

1.2.2 classification. A grouping set in order shown, i.e. alphabetically into categories and classes, of parts or materials that share common attributes.

1.2.3 code of practice. Document that recommends practices or procedures for the design, manufacture, installation, maintenance or utilization of equipment, structures or products (from ISO/IEC Guide 2-1986).

NOTE. A code of practice may be a standard, a part of a standard or independent of a standard.

1.2.4 coding. The designation of items by reference numbers or letters in place of the full description. A code may be allocated according to a classification system, but this is not essential. The simplest code may be allocated by consecutive accession to a list.

1.2.5 performance specification. A specification of requirements of an item or material in terms of the performance in service rather than in terms of its physical or other characteristics.

1.2.6 procedure. A specified method of carrying out a particular task.

1.2.7 process specification. A specification of the conditions and methods to be adopted, arranged sequentially, to define a process.

1.2.8 purchase specification. A specification prepared for the purpose of ordering goods and services. This term may be used in place of 'purchase order description' but it usually implies a more comprehensive specification issued as a separate document.

1.2.9 rationalization. The procedure for reducing variety by the simplification of existing ranges.

1.2.10 specification. Document that prescribes the requirements with which the product or service has to conform (from ISO 8402-1986).

1.2.11 standard. Document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context (from ISO/IEC Guide 2-1986).

1.2.12 standardization. Activity of establishing, with regard to actual or potential problems, provisions for common and repeated use, aimed at the achievement of the optimum degree of order in a given context (from ISO/IEC Guide 2-1986).

NOTE. In this publication the term also covers action in all areas of company operation to improve efficiency by unification or simplification.

1.2.13 variety control. Selection of the optimum number of sizes or types of products, processes or services to meet prevailing needs (ISO/IEC Guide 2-1986).

NOTE. Variety control is usually concerned with variety reduction.

Section two. Principles of standardization

2.1 The meaning of standardization

In order to determine in which areas standardization can be carried out, it is first necessary to understand the meaning of the term and its scope and benefits. Secondly, these should be related to the nature of each organization.

The above definitions, however comprehensive, cannot convey the amount of work that goes into producing standards. Further explanations may be found in the documents and books referred to in the bibliography in appendix A.

Inevitably the contents of this publication are based on experiences from industry, which is where there is the greatest practical activity. However, provided that the advantages of standardization are recognized, every director who has problems of communication and rationalization can apply the principles of standardization.

The advantages of standardization should be fully recognized and the variety of standing orders, company procedures and data sheets should be controlled and issued in a standardized format that indicates their status and authority. The systems and values that are the framework of policy on management, design, manufacture, sales and accounting should be established without ambiguity. If not controlled and formalized, the variety of standing orders and procedures can accumulate in a haphazard manner which may lead to misunderstanding and abuse. With the participation and co-operation of all concerned with their authorization and use, in-house standards enable the best practices to be retained and the rest to be discarded. Standardization should be regarded primarily as an opportunity to provide a basis of communication and exchange of ideas, goods and services in a manner that can

promote development and consolidate achievement. Standards of safety and health, consumer protection and overall economy will benefit from the above participation. Figure 1 illustrates the aims of standardization and figure 2 expands these to show the results.

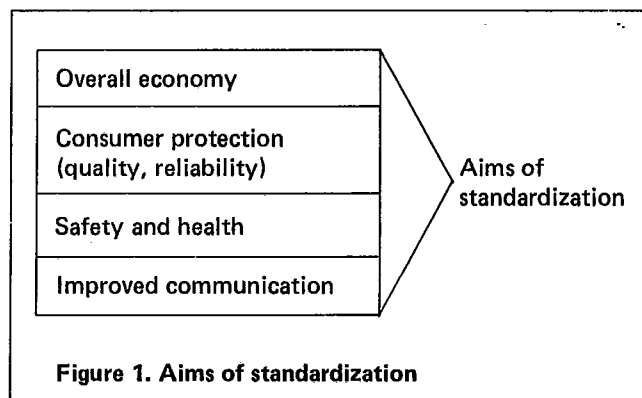


Figure 1. Aims of standardization

2.2 The management of standardization

About three-quarters of the industrial undertakings in the United Kingdom have fewer than three hundred employees. In such firms standardization may be managed by an executive such as the general manager or the chief designer, perhaps with a part-time standards engineer under his direction.

The management of standards is likely to be completely different in a large company employing many thousands of people in several geographically separated units, each of which may be largely autonomous in operation. In such

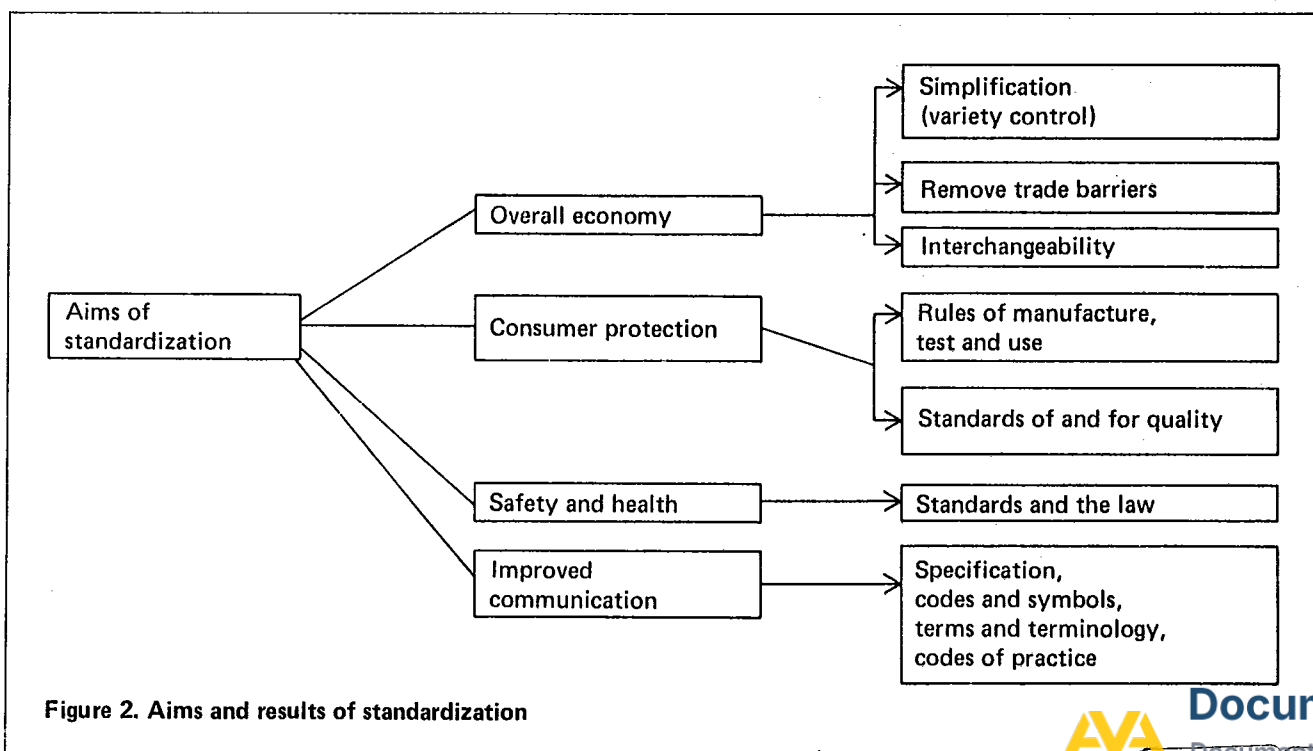


Figure 2. Aims and results of standardization

cases standardization may be controlled by a standards executive responsible to the central management and supported by standardization activities at each locality. In whatever manner the day-to-day operation is conducted, it is essential that standardization is directed from a senior level rather than left to function on the initiative of a junior member of the organization.

The nature of the industry also influences the standardization activities. In industries such as machine tool manufacture, steel-making and other equipment users, the standardization organization may have different priorities and objectives from those in manufacturing companies specializing in a restricted market or in high technology areas such as household meters, electrical machines or electronics.

In steel-making and machine tool manufacture, the formulation of international and national standards has a significant effect on the product of the company, and standards engineers may be employed to specialize in that field. Many companies, however, are represented on national and international committees by the product engineers or designers. In such cases the company standards engineer is concerned with the user aspects of national and international standards and with internal company standardization such as drawing office practice, purchasing and stores control.

Sometimes large concerns recognize the importance of making a practical contribution to national and international standardization as users in fields such as drawing office practice, screw threads, quality control, finishes and welding. They generally have central standards departments for this purpose.

2.3 Standardization in user industries

2.3.1 Large organizations

Some of the largest organizations in this country are not primarily manufacturers of engineering equipment but utilize plant and equipment and related spares and consumables. The Post Office, the Ministry of Defence, the public utilities, and many organizations in the chemical and petrochemical, coal and steel industries have very large capital investment in engineering goods but they do not themselves market engineering products except, in some cases, through relatively small subsidiary companies or divisions.

2.3.2 Product standards

There are numerous national and international standards for basic materials such as chemicals and steel, both for composition and test methods. In some instances, such as gas and electricity, legal requirements for the product

quality also exist. Company specifications extend standardization into the purchase of raw materials, the specification of quality during various process stages and instructions for testing to ensure compliance with these requirements.

2.3.3 Administration

Because of the size of many organizations and their geographical distribution, standardization of administrative procedure is often a necessity to ensure common financial reporting methods, common personnel procedures and a common house style to establish a corporate image. This may, for example, extend to the standardization of vehicles and buildings. Such administrative standards may appear unnecessarily rigid at first sight, but if they are correctly prepared they can give sufficient flexibility to permit local divergence within an overall corporate plan.

2.3.4 Plant

In plant purchasing, standard specifications are required to ensure fitness for purpose whilst leaving the supplier ample scope to produce economic designs. Maintainability is a particular problem, and correct specification is seen to be important when measured against downtime costing several thousand pounds per hour. A great deal of care is therefore expended in the design and presentation of maintenance manuals to help speed up fault-finding and rectification. Process plants are usually designed on a 'one off' basis, so standards should not only permit the supplier scope in design, but also allow flexibility for different applications. An extreme example perhaps is the application of hydraulic systems in steel mills and underground mines where there is a similar fire risk, although the plants being controlled differ. This example also introduces the concept of safety which is closely linked with plant specification and codes of practice for installation, operation and maintenance.

2.3.5 Spares

Spares rationalization can range from a simple exercise to ensure that, for example, safety helmets are purchased to comply with the requirements of BS 5240, thus requiring only one stores location reference. It can, however, be more difficult for component parts. A ball bearing, for example, may be identified in one way by the bearing manufacturer and in different ways by manufacturers of equipment into which that bearing is designed. The equipment manufacturers should include the bearing maker's identification, as well as their own, in maintenance manuals or spares lists. If this is not done, users of the various pieces of equipment could find identical bearings with more than one designation and therefore with separate stores locations. The standards engineer in a user industry applies the same basic techniques of standardization in producing similar standards as in any other industry.

2.4 Some rules for introducing standardization

2.4.1 General

All too frequently the maximum benefits of standardization are not realized because of lack of investment and authority. It is essential that objectives are clear and compromises are reached to achieve these objectives.

Departmental heads may veto any compromise that affects them adversely. This can result in long delays before proposals gain acceptance, a watering down of the standard, or no standard at all. The standards engineer should therefore have sufficient status and ability to overcome such difficulties.

The following well established rules should be observed for company standardization.

2.4.2 Standardization should be self-justifying

A co-ordinated approach by the specifier and the user should result in a standard which fulfils a definite need and which the majority will accept. It has to have advantages over the possible alternatives. Those who use standards should not be penalized by so doing, nor should those who depart from standards stand to benefit.

2.4.3 Standards may be 'voluntary' or 'mandatory' within the company

The use of standards can be on a voluntary basis, but it may be expedient, and even necessary, to give mandatory status to certain standards which should indicate clearly the authority under which they are published and then be supported by an effective and efficient service for maintenance. Making standards effective is a topic dealt with more fully in section eight.

2.4.4 Standards should represent the highest common factor, NOT the lowest common multiple of the variables

The temptation to create standards which cover 100 % of everyone's requirements is to be resisted. Too much variety will result if too great an area is covered. It is better to cover the majority of the requirements with a few sizes in a range. In this way, the greatest economies from variety reduction will be gained and a demand for further standardization created.

Frequently even this policy is compromised to avoid:

- (a) producing a standard that no-one accepts; or
- (b) producing a standard that represents the 'lowest common denominator'.

2.4.5 Standards should be presented in a manner that will encourage their use

It may even be necessary to present the same information in a different way to each individual user. For example, standards for purchased materials may have to be presented as a catalogue for the storekeeper, accompanied by applicable data for the designer or with alternative sources specified for the buyer.

2.4.6 Standardization should be achieved with the collaboration of the users

Standardization should be developed by co-operation, not compulsion. Those who benefit from standards should be encouraged to contribute to their preparation so that they know how they are to be implemented.

2.4.7 Standards should be introduced in palatable quantities

It is better to introduce new standards gradually so that people have time to assimilate the contents, rather than issue complete volumes which cannot be digested in the time normally available to do so.

2.5 Evaluation of results

Managements who have decided in favour of initiating a standards programme may in time seek assurance that the programme is proving effective and that the cost is justified. The problem of evaluation is extremely difficult and depends on having proper objectives against which the effectiveness can be evaluated. This is particularly true in areas such as management control, information service and interdepartmental liaison where benefits are intangible, but which are a major part of standards work.

Table 1 lists in general terms the advantages and disadvantages of standardization, only some of which are easy to quantify in financial terms.

Table 1. Advantages and disadvantages of standardization	
Advantages	Disadvantages
Reduction of overhead costs labour costs material costs stock investment stores space spares and maintenance costs equipment costs Improved availability of parts management control quality and reliability Increase in customer satisfaction manufacturing efficiency communications Compliance with legislation	Marginal increase in costs in some cases Cost of standardization exercise Cost of changing Restriction of freedom of choice Practical obstacles to implementation and enforcement Cost of maintenance

In the absence of management directives on particular exercises the standards engineer should begin by making his own assessment of the costs, savings and extra benefits to be gained. The disadvantages of not having a standard should also be included in the assessment. It may be quite

inadequate to think in terms of presenting an evaluation purely in terms of a balance sheet of component costs. Financial considerations are important, but they may be more relevant in terms of the total budget, the costs of administration and the needs for standardization or control in a particular area. For example, when considering the addition of a further variation it is necessary to bear in mind how many types are already stocked, the total stock investment and administration costs in that area and the need for rationalization.

It is possible that suitable methods of accountancy could be devised to show more directly the adverse effect of introducing variety rather than using standard parts, but

little has been done in this field. Such costs are generally hidden as increased overheads.

The collection of data should take place first. This should give some clear indication of where the benefits are to be expected and a justification for proceeding. Tangible assessment of the results can be difficult since many benefits of standardization are cumulative. Each organization should decide to what extent and by what methods direct evaluation of results is necessary or practicable. Like quality assurance schemes, standardization requires vision and investment in order to produce results and it often depends on adequate justification prior to inception.

Section three. The standards engineer

3.1 Qualifications

Most standards engineers have professional engineering qualifications and have been persuaded to specialize in standardization because of their natural abilities such as a flair for coherent and factual presentation, reliability, stability, patience, a logical mind and diplomacy. The nature of the job demands a leader, not a follower.

3.2 Job specification

In 1971 the job specification of a standards engineer was included in CODOT*, which classifies an occupation by its work content and not on the basis of qualification, status or level of skill. The specification is as follows.

'Standards Engineer. Develops standardization and implements local, national and international standards within an undertaking.

Examines existing processes, procedures and other activities to ensure that, as far as possible, standard practice and optimum procedures obtain throughout the undertaking. Consults with research, design and production departments, and formulates specifications in relation to company and/or other standards.

Reviews components and items of equipment to eliminate unnecessary variety while retaining suitable alternative choices. Reviews standards in the light of improvements in materials, advances in techniques and changes in statutory requirements and in national and international standards. Develops or arranges for the development and implementation of standards concerned with new concepts and original ideas and compiles new standards as necessary.

Maintains an up to date library of all relevant standards. Keeps abreast of national and international developments in standardization. Provides information and advice on all standards matters. May represent his organization on national and/or international committees concerned with standardization.'

The term 'standardization' and the references to 'standards' require amplification, which this publication aims to provide.

3.3 Function

The standards engineer's main challenges are associated with fostering relationships within the company or group of companies to promote the benefits of better collaboration and communication, consolidating the results of such co-operation to produce permanent economies or improvements in the form of standards.

The aims and responsibilities of the standards engineer may extend across all the activities of the company from research and design to production, quality control, sales,

packaging and in many organizations may include accounting, personnel, fire and security. Although the skills and accumulated experience can be applied in any field, some of the more commonly expected functions are as follows.

(a) *To develop standards which, through unification, will lead to cost savings, reduction in design and manufacturing time, and improvements in performance, servicing and the availability of spare parts.* This can be achieved by the specification of raw materials and bought out components and by preparing codes of practice.

(b) *To ensure that all official documentation is prepared in an acceptably uniform manner.* The drawing office of a manufacturing organization is the hub of production documentation and therefore naturally is the section most concerned with technical standards. BS 0 is a useful basis for company standardization, as it provides a guide to the production of national standards, but a similar guide for local application should be available within the company.

(c) *To liaise between different functional groups in the organization to improve communication.* A co-ordinating authority can be established by the formation of committees set up to improve efficiency through co-operation between such functions as development, purchasing, production, and sales. The skill and unbiased attitude of the standards engineer should be utilized to produce draft standards which incorporate the views of all concerned.

(d) *To provide information to keep products or services up to date with standards specified by contract or statute.* The existence of, for example, health and safety legislation and EEC Directives, as well as national and international standards make the task of keeping company standards up to date a difficult one. The company library and standards department and specialized legal and technical officers are frequently linked for this purpose. If not, these departments should have close working relationships.

(e) *To ensure that the organization's views are expressed during the development of national and international standards.* Publications that give information on the progress of national and international standards should be reviewed regularly and relevant drafts obtained and considered. In some companies the standards engineer represents the company on national and international standards committees, but frequently it is necessary to obtain the views of various members of the company with specialist knowledge.

(f) *To identify the areas in which rationalization should result in cost savings and initiate retrospective exercises where necessary.* Classification and coding are essential tools to organize products, components and materials in such a way that standards can be developed as a result of variety reduction and control exercises.

*Classification of occupations and directory of occupational titles. Manpower Services Commission. Careers and Occupational Information Centre.

3.4 Technical knowledge, skills and personal qualities

The technical knowledge and skills required to accomplish such work should include the ability to write specifications, prepare technical illustrations, and to be an effective committee member or chairman. Familiarity with information technology systems and an appreciation of their value in standards work is becoming increasingly necessary.

The complexity of the job is such that, whilst specialists may be co-opted to assist in particular areas, the standards engineer should have sufficient knowledge to employ them effectively. A basic technical appreciation of the industry in which he is engaged is essential, and technical qualifications are an advantage even in a non-engineering industry.

The personal qualities of a standards engineer are vitally important. Persuasion, compromise, diplomacy, tact, patience, resilience are generally required of the standards engineer. Standardization exercises are often undertaken on his own initiative, and in so doing he has to overcome the objections of people with a vested interest in not conforming to the majority. The need for versatility is obvious. His involvement in discussions with the purchasing, stores, accounts, production, design, and sales functions give him an appreciation of the organization that is matched by few people in other occupations.

3.5 Position in the organization

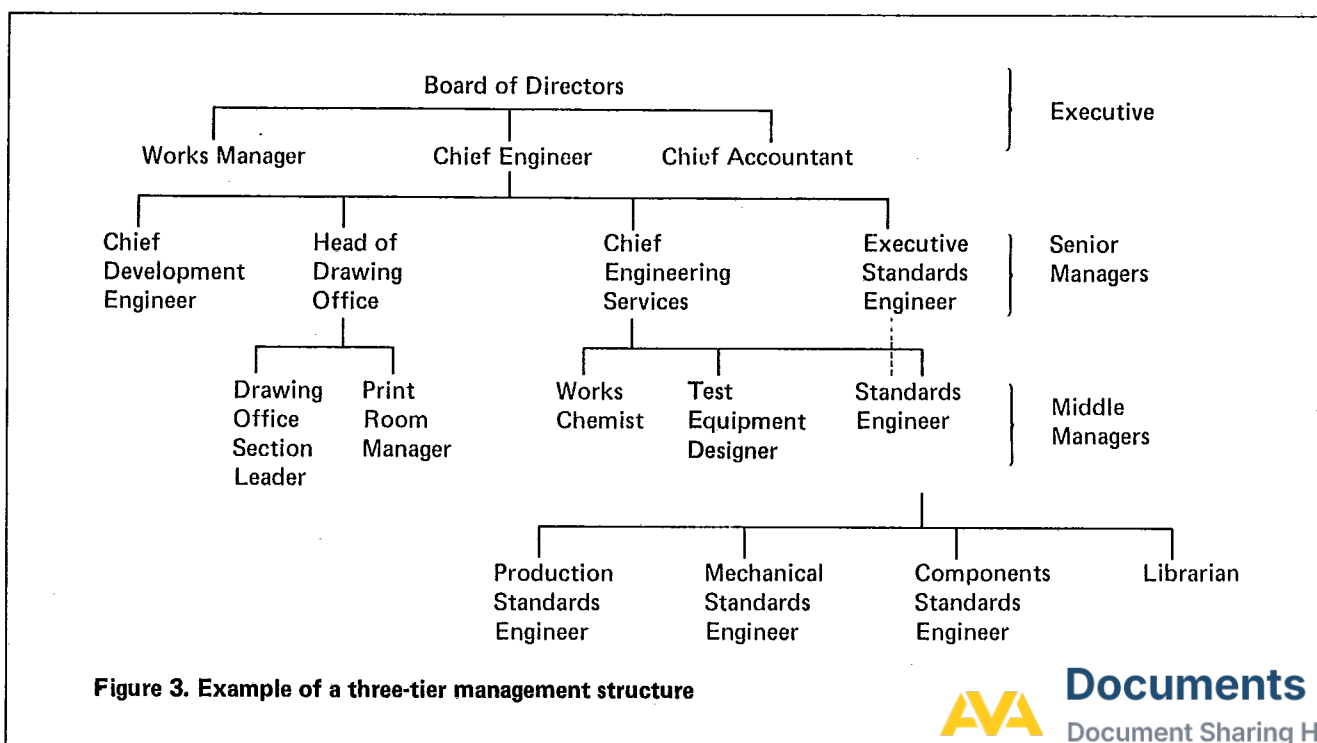
The majority of standards engineers would consider themselves to be middle management although it is significant that those who belong to the senior strata are often more successful in the implementation of standards. In the past

they have been collectively criticized for lacking professionalism and this is reflected generally in the lack of career structure. Too often their work is not part of a promotional path and the methods of appointment are frequently informal. These criticisms, if valid, usually add to the frustration of the standards engineer and reflect upon the company which fails to provide the person appointed with the best facilities and directives to succeed.

Many experts feel that the standards function should be a department rather than a section and that its manager should be responsible to the technical manager, if not to a higher executive. All agree that, on the company organizational chart (see figure 3), the standards function, which may be combined with the quality function or another, should not appear at a lower level than the design department or drawing office. The size and functional level of the standards department in the organization usually depends on the size and type of company and directly reflects the company management's attitude towards standardization.

3.6 Responsibility

It is essential that the standards engineer be respected and accepted throughout the organization, if he is to inspire confidence in his judgement and develop personal contacts at all levels within and outside the organization. On many occasions he will find himself with access to confidential data on the shop floor, in offices or in the executive suite. He therefore has the responsibility of dealing with this kind of information discreetly and with respect for the persons involved. As a representative on national and international committees it is essential that he presents the official viewpoint and not a personal one. As a manager he should



be able to allocate priorities within the standards department to the best effect and be responsible for its efficient running.

Committee meetings and conferences, which may be important to the future of the business, are held in various parts of the United Kingdom and abroad. The standards engineer should therefore be prepared to travel.

3.7 Training

A standards engineer requires knowledge and experience that will permit him to appreciate the functions of all aspects of company business.

It is extremely unlikely that a company will have an established training programme for standards engineers since it is a specialist occupation. It is common practice nowadays for heads of departments to base remuneration on a written job specification and have a development or training programme to help the employee to achieve the required performance.

A suitable training scheme should be based on study of the organization and the identification of areas where standardization can be applied. The duration of this depends on the company, but it should normally be not less than two years. The training programme should be based on the requirements of those using standards and the setting up of projects within these sections. Table 2 should be used selectively: it indicates the possibilities and scope. Training in some aspects may be unnecessary because of the restricted responsibilities of the standards section or lack of company need.

3.8 Training courses

3.8.1 General

The British Standards Society's training panel organizes several short training courses each year. The content of these courses ranges from company standardization

techniques such as classification, coding and the organization of company standards information, to topics such as quality assurance and certification schemes. Regular meetings to discuss all aspects of standardization are also arranged by the regional committees of the British Standards Society. Held usually in Milton Keynes, London, Birmingham, Bristol, Manchester, Newcastle and Glasgow, these meetings, which are open to non-members, are advertised in the monthly *BSI News*.

3.8.2 Who is to be trained?

Besides those engaged professionally as standardizers there are others who would benefit from a training on the benefits of standardization. Most engineers proficient in their own field would benefit from such training as a basis for carrying out their own projects, as would skilled workers, craftsmen and technicians who are called upon to maintain product standards, and those whose profession is education and training.

3.8.3 Specialized training

The preparation of a standard often becomes an exercise in company organization. The standards engineer may find himself not only recording existing procedures but also trying to explain them to others in the chain.

To achieve these tasks with an acceptable degree of competence requires a knowledge of management organization and methods such as inventory control, management accounting, profit planning and control, business appraisal and investment appraisal.

A basic understanding of these subjects together with experience of costing techniques, flow charting and network analysis will enable the standards engineer to produce standards recording existing and new practices.

3.8.4 In-house training

The standards engineer should be involved in the training of staff and he should make certain that they are informed of the scope and benefits of standardization.

Table 2. Training requirements

Section	Standards requirements	Training notes	Project
Design	National and international standards for materials Standard parts manual (including bought out parts) Coding system Drawing practice (BS 308) Design standards Drawing issuing and maintenance procedures Modification and departure from drawing procedures	If standards are not readily available, the designer makes his own! Product standardization starts at the design stage	Working with design team, rationalize and standardize parts and material across the whole product range. Note that the allocation of company code numbers should be the responsibility of the standards engineer. A foolproof system is therefore required to ensure that obsolete part numbers are deleted from the parts file
Purchasing	Standards parts manual In-house coding system Supplier coding system Standardized purchase descriptions Sub-contracting standards Purchasing procedures	The quality control and purchasing activities are two areas that are basic to company standardization and the standards engineer should be given practical experience in both sections in order to appreciate the importance of keeping standards and specifications current	Review and standardize purchase orders across the whole range of purchased materials and components
Production	Standard job instruction sheets Standards for factory layout workplace layouts tooling layouts consumable tools Coding system for operations (used for work study and costing) Process specifications Workshop codes of practice	Simple standards are more easily understood and used. The use of photographs should therefore be considered for production standards	Working with production management and industrial engineers, create standards for items listed in requirements column
Quality control	Standards, specifications and methods of test for all raw materials, parts and tools used within the organization Organizational procedures for quality control of bought out, manufactured parts and processes and plant Quality audit procedures	Standards engineer should be given experience using standard test procedures	Work with inspection for goods-inward, manufacture, packaging and despatch
Finished products	Coding system for finished products Standards for packing materials and quantities Instruction leaflets		Review profitability of each product and use as a basis of product rationalization
Despatch	Standard shipping procedures Container standards Packing specifications	Since shipping regulations and procedures can change rapidly, it is important that the standards engineer is kept up to date	Working in forwarding department, review and simplify procedures to the company's advantage

Table 2. (concluded)

Section	Standards requirements	Training notes	Project
Accounting	Standard procedures for invoicing, sales and purchase ledgers, financial statements Coding systems for customers, customers' ratings, suppliers and payroll (employee category)	One of the most fruitful areas for a standards engineer to operate. He should be given a good working knowledge of the accounting sphere in order to simplify and standardize the existing (and historical) methods. An appreciation of computer systems and programmes is useful	Working in accounts department, learn procedures for accounting and costing
Personnel	Standards for job interviews Induction and operator training Standard procedures for recording labour turnover, absenteeism Coding system for employee categories Standard terms and conditions of employment Job specifications	Company standards for operator and staff training provide a variety of training projects	Working in training school, provide codes of practice
Safety	Standards for fire procedure, passenger lift breakdown Good housekeeping and cleaning Standards for machine and process safety, marking of passageways, signs and notices Health and safety legislation Safety in design	It is essential that the standards engineer becomes safety oriented and should be shown areas where safety is vital	Study legislation such as the Factories Acts and Health and Safety at Work etc. Act and remedy areas of non-existent or poor safety standards
Works engineering and maintenance	Standards for pipeline identification, lubrication, services (electricity, gas, water, steam, air) Planned maintenance procedures for all services and production plant Coding system for plant and machinery (including office machinery)	An area which is often overlooked from a standards aspect!	Working in maintenance department, establish an identification system for all plant and machinery
Company library	National and international standards Technical reference books Trade journals Trade catalogues Awareness bulletin	The company library may be an integral part of a standards section. People should be encouraged and trained to use it	Establish a simple information retrieval system
General	Standards for fixtures and fittings (office equipment, furniture, lamps, door handles) Standards for letter writing Standards for statistical procedures Standards for computing	There is hardly an area of company operation where standardization cannot be applied. The organization and methods department should use the common mechanism of standards for the publication of procedures	

Section four. Functions of a company standards department

4.1 Objectives and problems

The previous section explained the functions of the standards engineer. This section deals more specifically with particular objectives and the solution of problems encountered in setting up a standards department.

4.2 Setting up a standards department

4.2.1 Responsibility

Persons engaged in standards engineering vary from technical and commercial assistants to company directors. In the smaller company the standardization function may fall within the responsibilities of a senior member of management, so that existing knowledge and experience may be used. Large firms may employ specialists to introduce a more professional activity into particular areas and place the standards engineer at a level in the organization where he will be able to operate most effectively.

It is a measure of the scope and diversity of the task that each job specification differs to suit individual company requirements.

4.2.2 Location

The standards engineer may be located in, or attached to, the drawing office or purchasing department because of the affinity of standard specifications to drawings as part of the company documentation system or to achieve a measure of rationalization in purchased items and stores. This is not, however, the only possible location for a standards department. It may be an independent department or it may operate in conjunction with the quality control function. This has the advantage of combining two departments with similar objectives and range of operation and responsibility.

4.2.3 Objectives

The need for standardization in a company is acknowledged by the appointment of the standards engineer. This represents considerable investment by an organization so clear objectives should be stated in writing from the outset, and the standards engineer should make sure that he understands them. If he is not clear about what is expected of him, he should ensure that these objectives are clarified by a senior member of the management team with agreed terms of reference and a programme of objectives.

4.2.4 Facilities

In the initial stages, facilities such as typing, word-processing and printing will probably be shared with other sections. However, as the first exercises are largely administrative and organizational, this should not present an immediate problem.

Once the company standards manual is compiled, however, a supporting staff of at least one clerk/typist to assist with distribution and maintenance will be needed.

4.2.5 Viability

Since it is essential that the standards department remains economically viable, resources should be carefully deployed with regard both to existing and future tasks. The location of the standards department having been decided, the work load should reflect the responsibilities of the related department. For instance, if the standards department is attached to the drawing office, part of the functional drawing office activity (such as the specification and coding of all bought out components and materials) should be incorporated into the day-to-day work of the standards department. This will enhance the authority of the department and leave the resources intact for other specialized standardization activities.

The established standards department should be involved in the design and drawing stage to ensure that standards are introduced and maintained from the start of a project.

4.2.6 Rate of growth

The standards department should not be allowed to grow by developing only its own activities. Growth should be related to the economic need for standards. A standards department can employ specialists but it should not overspecialize. In a large organization a standards manager employing four standards engineers specializing in:

- (a) purchased components;
- (b) raw materials;
- (c) manufactured components and processes;
- (d) plant and equipment;

and supported by a typist, librarian and clerk should be able to cope with all the basic standardization. An increase in the number of staff may be necessary as a result of an increase in 'on line' work or volume of work in each area, for example, if allocation of drawing codes is undertaken and the number of drawings increases beyond the capability of one person to deal with them.

This staff can of course be reduced according to the size or nature of the organization by combining some of the responsibilities. An established standards department, however, cannot be expected to function without some clerical support for the standards engineer.

4.2.7 The first exercise

It has already been suggested that the standards engineer will have been appointed because there are problems associated with allocating the task to existing functions and because of the need for special skills to establish the relationships that are essential to the accumulation of the required data. He will first organize his information for storage and retrieval, remembering that the system should be capable of being understood and used throughout the organization by people other than his trained staff.

These may not seem particularly difficult tasks, but success in these aspects will set the pattern for all that follows.

4.3 Information dissemination

4.3.1 How much data?

Whatever objectives have been set there will be a need for the collection of information from many different internal and external sources. The data may range from standing orders or interdepartmental memoranda to national, foreign or international standards. It may also include suppliers' catalogues, customer specifications, technical reference books, reports, journals, directories and dictionaries.

These data are necessary for the standards engineer to make objective comparisons and produce authoritative standards. As will be explained in more detail in section seven, however, the making of standards is not confined to the standards engineer. Storage should therefore be organized and based on library techniques for cataloguing and indexing so that others may also use the information.

The use of electronic data processing and storage will depend on the extent to which the company is equipped to access it.

4.3.2 Communication

Dissemination of incoming data also requires a system. This is particularly important for the maintenance of standards which should be communicated efficiently and promptly, perhaps through an awareness bulletin. Setting up the standards department as the sorting house and central storage and distribution area for all technical documentation has economic advantages as well as being a means of standardizing the writing of reports, specifications and test instructions.

4.3.3 Use of outside resources

In very large or specialized organizations a separate library with a professional staff may exist. In this case the standards engineer and librarian should work closely together. However, if such expert assistance is not available locally, there are other outside organizations which can be extremely helpful. For example, working relationships can be developed with civic libraries and public authorities as well as with the professional institutions and commercial enterprises who deal in microfilmed data. There are many industrial organizations who are also willing to co-operate in the exchange of technical data such as standards, and membership of the British Standards Society is an excellent way of gaining knowledge of them and of their specializations. Trade associations such as PERA have well-developed technical information systems which are available to their members.

The British Library publication 'Guide to Government Department and other libraries' which is published every two years, lists many useful sources.

4.3.4 Collection and storage

The standards department should file and index all technical data and standards used in the organization. The collection should be advertised and made freely available to anyone who wishes to consult it. The operation

of this principle results in a two-way exchange of information. Recognition that authoritative information is available from a reliable source eventually leads to a flow of information into that source from people who begin to realize the advantages of having an efficiently organized standards department.

4.3.5 Maintenance

Increased activity in standardization, specification and legislation makes the collection of an up to date set of standards an arduous task. It is important to ensure that official specifications or standards are maintained throughout the organization. This requires the regular screening of official publications that notify revisions and amendments and an efficient recording system to locate the items that may be stored in the library or elsewhere in the organization.

It is essential to the standards engineer to keep up to date not only with national and international standardization activities by reading *BSI News*, but with many other activities that may affect standards. Periodicals such as the HMSO *Monthly Catalogue*, the *Daily List of Government Publications* and *British Business* provide information on British Government and European Community legislation and other relevant topics.

The collection of technical information and current awareness bulletins can be valuable to other specialists in the organization such as the safety officer, chief designer and works manager.

4.4 Publishing standards documents

It is a primary function of any standards department to publish documents which clearly state the approved principles and practices to be applied throughout the organization. Authoritative statements have many sources and a variety of forms, but it is important that they should be presented in a manner commensurate with their authority and in a form that is readily accessible and understandable.

The company standards manuals should be the company's official 'enquire within' and they may cover some or all of the following:

- process specifications;
- purchase specifications;
- catalogue of purchased items;
- organization manuals for manufacture, design, packaging, administration;
- codes of practice.

This list is basic and is capable of extension depending on the nature of the organization.

The purpose of standards manuals is to communicate, and by doing this efficiently to provide the user with a means of identifying and retrieving official and authorized data for daily operation. The economic benefits of rationalization should result from their compilation.

The BSS publication PD 6489 'Guide to the preparation of a company standards manual', gives more detail on this subject.

4.5 Classification and coding

The scope of coding is very wide: it can encompass many different aspects such as product identity, drawing number, stock numbering, stores location, specification and spares. It is not generally recognized that the benefits of classification and coding can be attributable as much to the disciplines involved in implementation as to the efficiency of the codes. For example, many parts do not go beyond the drawing board if the coding and classification system reveals the existence of a similar part.

Codes need not be complex but they require organization. More coding schemes fail through over-complication than through over-simplification.

The standards department should maintain all coding systems to ensure an integrated approach. It is important to exercise control to reduce the risks of allocating the same code to more than one item or of allocating different codes to the same item.

Company standards should be available to explain the scope and use of codes and keep revisions or extensions under control.

The standards engineer should ensure that any code has sufficient significance to obtain maximum benefit within the economic constraints of its implementation, so he should give careful consideration first of all to the classification system to be employed. It may be thought easier to design an integrated classification and coding system to suit all requirements rather than to modify an existing system. The opportunities to do this, however, are rare and a modified system may be achieved quite successfully in many cases.

4.6 Specification for procurement

4.6.1 General

Purchasing or procurement specifications are sufficiently important to rate a special mention. The control and specification of bought out raw materials, components, plant and equipment, spares and consumables require particular attention from the standards engineer, who can apply techniques such as classification and coding and cataloguing to great effect. Since procurement problems can be aggravated by inadequate specification, restriction of supply sources or excessive variety, he should aim particularly to make improvements in these areas.

4.6.2 Inadequate specification

In those areas where standardization has not been introduced, components may be specified by a development engineer through the design drawing office to production planning and hence to the buyer for procurement.

The standards department should reduce the potential dangers of this chain by being responsible for the purchasing description which is specified on the order.

4.6.3 Restriction of supply sources

Alternative sources of supply are a necessity for bought out items.

Special 'company purchase specifications' that differ from, or add to, national standards should be avoided wherever possible: they restrict the sources of supply and take a great deal of time and expertise to maintain.

4.6.4 Excessive variety

Needless time and expense is spent in procuring small quantities of many varieties of product. Problems arise not only in the time required to repeat orders but also in maintaining the stock levels in stores.

Variety control can be achieved by compiling standards for use by the designer to avoid the addition of unnecessary parts and by retrospective variety reduction. The standards engineer should identify the areas where such rationalization may be beneficial and then ensure that it is properly carried out.

It is essential that standardization is applied early in the design process if it is to be of benefit at the procurement stage.

4.7 Variety control

4.7.1 Scope

Management should specify the order of priority in which variety will be controlled within the company. Priority may be given to the purchased content such as materials, fasteners, or components in one company, and to the documentation system, the office equipment and stationery, small tools or even the product in other companies.

The scope is wide and the methods vary. It is important, however, that an extension of the scope of standardization should not always be accompanied by an enlargement of the standards budget. Variety reduction should pay for itself by reducing the effort in maintaining subsequent control. There is no reason why a small section or an individual with patience and persistence should not eventually extend standardization to cover all aspects of the business.

4.7.2 Method

It is rarely possible to reduce variety retrospectively; this can be very expensive because of the effect on existing designs, drawings, planning layouts and existing parts in stores.

It is much better therefore to control variety by prior organization and discipline. It is of primary importance that company standards which clearly state the official policy are available. It is important that these standards are then implemented, particularly by designers and draughtsmen.

Even when such standards have been established, it is essential that the standards engineer monitors all the activities that are a part of variety control procedure. For example, if the standards section codes all items proposed for use before they are quoted on parts lists, a system of 'vetting' all new components and materials is, in effect, achieved.

4.8 Drawing office practice (see also 5.5.3)

Manufacturing data will originate from various sources such as design, purchasing, planning and inspection. The drawing office and the standards department should, however, be the only sources of official information. Other instructions in the form of memoranda or handwritten notes should have no authority for manufacturing purposes.

The standards department should complement the drawing office by establishing and recording the standards for design, manufacture and quality control throughout the organization as well as by maintaining the 'drawing office handbook', which should specify the drafting practice standards to be followed.

The success or failure of standardization in an organization will be reflected in the work of the drawing offices. It is therefore essential that the draughtsmen be made fully aware of the scope and benefits and that they ensure that standards are implemented.

4.9 Design centre control

The control of design in some multinational companies is often complex as they may have design and manufacturing centres throughout the world. Although an effort may be made to limit the number of plants manufacturing the same product, there is always a possibility that a decision will be made to transfer products to another company within the group.

The mode of operation of such companies calls for central standardization of the technical documentation. If responsibility for documentation is not allocated at a high level, problems of compatibility will eventually arise.

4.10 National and international standards

It is a function of the standards department to obtain all national, international and foreign standards required in the organization, and to distribute them to those involved in their implementation. It is therefore essential to maintain records of the location of all the standards distributed, and to notify holders of all amendments (see section nine).

Relevant national and European legislation in fields such as health and safety and metrication should be reviewed especially when it refers to or affects existing standards or creates the need for new ones.

4.11 Quality assurance

The basis for quality assurance is the control achieved by the co-operation of all concerned in the design and manufacture of the product. (See also 9.5.)

An integrated documentation and specification system, designed to avoid ambiguity and duplication, should properly define the standards established and expected. This should cover particularly the specification of raw materials and other bought in parts, control of processes, packaging and proper use of sampling schemes when 100 % inspection testing is impracticable. National and international activity in the fields of quality assurance, certification and reliability is so extensive that the standards department should regularly check the company's policies in relation to these activities and it should have a systematic procedure for advising the appropriate departments or managers accordingly.

Although quality audit specifications can be issued in a separate series, other quality requirements are inescapably part of the manufacturing process. The quality manual should therefore be designed and compiled so that it can be maintained as an integral part of the normal specification system.

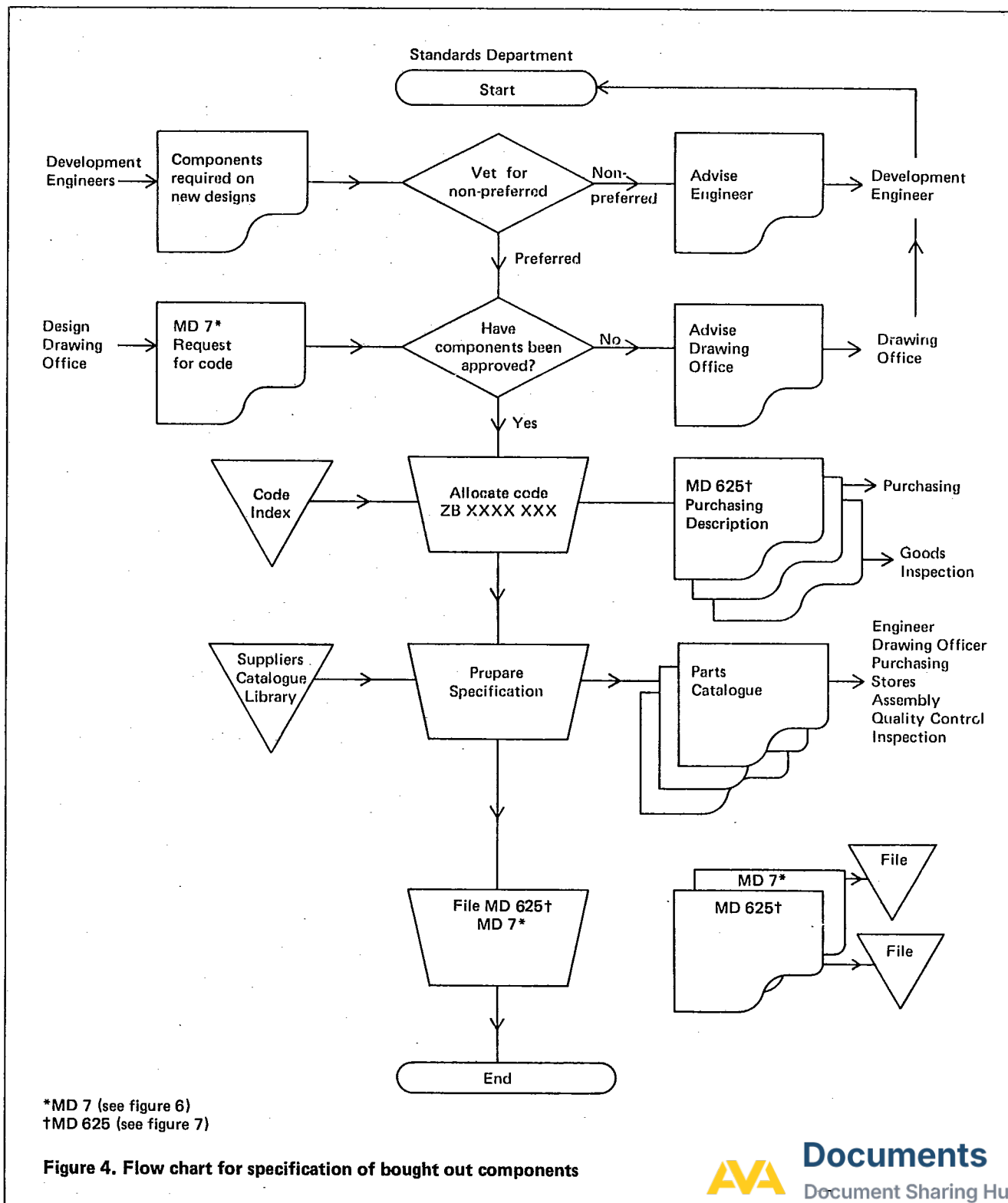
Major public purchasing authorities are tending to place more stress on quality assurance and guarantees of satisfactory procedures are requested in many of the contracts they draw up. (See 9.5.3.)

Section five. The organization of standards information

5.1 General

There is a need to abolish the haphazard arrangement of production instructions, purchase specifications and standing orders in many organizations and replace it by established routines in the form of standards (see figure 4).

The first standards manuals are usually compiled by collecting existing data, reclassifying it and presenting it in a standard format. For example, a bought out components catalogue may be compiled by collecting the purchasing descriptions from drawing office parts lists or stock lists, classifying the items into groups, coding them, and presenting the information as a catalogue sheet.



All company standards manuals should be issued in the same format, whether they are for manufacturing stock control or commercial and accounts procedures. They should comply with the following basic rules.

- (a) Each document should carry an authorizing signature.
- (b) The document should be easy to maintain. Each page should therefore be identified with the issue date.
- (c) Documents should indicate the scope, e.g. local, national, international.
- (d) Documents should be classified to aid retrieval and avoid duplication.

Standards information should be kept up to date by the establishment of a routine for feedback of information on the shortcomings, and for prompt reconsideration and the issue of amendments. A close liaison with the design department, production departments, the quality control organization and the training school, where applicable, is therefore essential.

This section considers four broad groups: parts catalogues, purchase specifications, process specifications, and codes of practice. The use of these groups is distinctly different: consequently their presentation as company standards manuals is also different.

5.2 Parts catalogue

5.2.1 General

Bought out parts and materials should be classified into groups of similar items and issued as catalogues.

Typical catalogues found in a large engineering company relate to mechanical components, electrical components, fasteners, raw materials, spares, small tools, plant and equipment, and stationery.

5.2.2 Contents

The functions of catalogues are usually as follows:

- (a) the communication of data on parts that are in current use, i.e.:
 - (1) code,
 - (2) purchase description (long description),
 - (3) inspection and test instructions,
 - (4) design application data;
- (b) as a guide to company preferred items, to encourage users to select these rather than non-preferred items;
- (c) to avoid proliferation of similar parts.

The use of a parts catalogue allows the description of the item to be kept up to date with the latest standards or amendments of suppliers' type number by amending the catalogue entry without amending all the assembly drawings that call it up.

It also means that suppliers can quickly and easily be added to, or deleted from, the catalogue.

As well as being the buyer's 'Bible', the parts catalogue will be used by the designer as a selection guide, by the

draughtsman to give outline dimensions for layout purposes, and by the goods inwards inspector for checking conformance to specification.

A typical catalogue sheet (see figure 5) should therefore contain for each part or range of parts:

- (1) a code for communication or stores location or filing;
- (2) a 'short' description for use on drawing or inter-departmental communication;
- (3) an outline drawing;
- (4) a 'long' description for purchasing use;
- (5) basic characteristics, ratings or parameters to aid selection;
- (6) quality control instructions.

5.2.3 Initiating a new part

The arrangements for the allocation of a code and for the specification of a new component are particularly important and, with careful planning, they should produce additional benefits. For instance, the request for a code can be made on a form which also contains the date, the name of the originator, the product and drawing number (see figure 6). The bottom of the form is used by the standards department for issuing purposes. The standards engineer compiles the catalogue entry from the form which is subsequently retained for record purposes.

5.2.4 Purchase order description

In preparing the purchasing description, the standards engineer can relate the designer's requirements to existing company and national standards. He can also vet the request to ensure that new parts are not added when suitable alternatives exist and that the correct specification is quoted. Figure 7 shows a typical specification for a computerized order form. (Note the exclusive use of capitals in this instance.)

This kind of form is produced as a result of the requisition (figure 6) and is used by the data preparation section for adding to the computer file by the purchasing department so that they may proceed with enquiries, and by goods inwards inspection prior to receiving a copy of the catalogue sheet. The form is disposed of on receipt of the revised catalogue sheet which includes this and other relevant information.

The standards engineer's task of compiling the catalogue can be considerably eased through the availability of support material such as the library of suppliers' catalogues, standards and reference books. It is common therefore for the standards department and the library to be closely associated.

Computerization of the catalogue may be feasible.

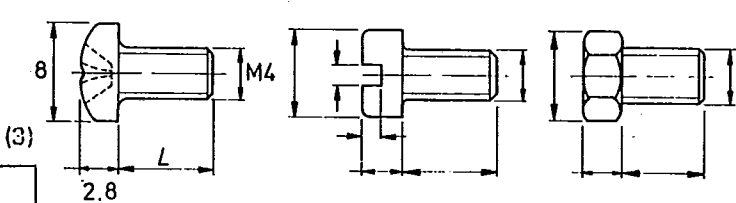
Standardized formats such as that shown in figure 7 will enable appropriate data to be rearranged and displayed to the user on a visual display unit either in response to a specific request or as part of a range with all related parts also displayed.

(2) 'SEMS' UNITS
M4

ZB 5186 038 (1)

STANDARD			
Issue	Date	Page	Continuation
1	4.77	1	--

All dimensions are in millimetres

(3) 

Fastener requirements: (5)
Screw to BS 4183
Washer to BS 4464

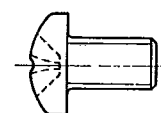
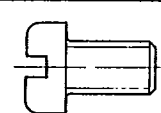
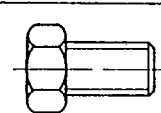
Thread tolerance:
BS 3643 : Part 2 medium class, 6 g
Coarse pitch

Material:
Screw: brass
Washer: phos. bronze

Finish

Finish	Symbol
Plain self-colour	A
Cadmium	B
Electro-Tin	C
Bright zinc clear passivated	D
Phosphate stain and oil	E
Hot dip galvanize	G
Chromium	J
Nickel plate	N
Blue tint to purchase spec. 95/010	M

Changes from last issue:
5.4.77

Head type	Washer type	Finish	Length L	Part
 Recessed pan head	Single coil BS 4464 'B'	D & M	14	038
 Slotted cheese head				
 Hexagon head				

(4) Order as: SEMS UNIT
Recessed pan head
Brass screw M4 x 14 to BS 4183
Phosphor bronze washer
Single coil to BS 4464, type B
Bright zinc passivated blue tint to specification 95/010

Supplier: Linread

(6) Quality control: 192.43.005

Figure 5. Example of catalogue sheet showing how the catalogue can be used to guide the user without pre-allocating the code number