Performance And Quality Assurance Testing

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Introduction

For a designer to prepare an effective and suitable set of specifications for furniture, he or she must first understand and then document the following:

a. The individual needs of the client
b. How each product is used under actual service conditions
c. How various competing products compare in quality and price

d. How each product may be expected to perform.

Success of the designer in fulfilling these requirements rests largely on his or her ability to quantify abstract statements concerning expected performance along with the ability to assess and quantify the performance of the furniture available so that a systematic determination can be made of the ability of the furniture to meet the client’s specific needs. This procedure allows the designer to make rationally based performance versus cost decisions. Few, if any, designers, however, are able to quantify their requirements. Hence, they ordinarily cannot unequivocally transmit their design requirements to the manufacturer. In addition, designers usually are not able to quantify the expected performance of the furniture they specify so that they are unable to make systematic rational cost versus performance comparisons.

Few designers truly research a product themselves; rather, they turn to other sources for information such as manufacturer’s representatives or confidants. Lacking first hand knowledge and consequently relying on what are perhaps un-proven sources of information, a designer may direct a client to a higher priced product merely because of his uncertainty about the quality of a new or different product. Without specific performance data and numerical end use requirement information, a designer may find that the result of his or her design efforts may not meet the desired performance expectations, and, in fact, the result may point toward negligence on the designer’s part.

There is, of course, considerable value in taking the advice of product information sources with unquestioned expertise in the area of interest. Should the designer or specifier become involved in legal difficulties as a result of failure of specified products under normal conditions of use, the designer can take little consolation in the fact that he or she received this performance information from a manufacturer’s representative or from a personal friend or confidant.

As the preceding discussion illustrates, there is a need for more definitive methods of defining client needs and expectations as well as for better methods of evaluating the ability of the furniture offered to fulfill those needs and expectations. Perhaps the European experience — the performance tests and the quality assurance programs employed there — provide the answer. Although relatively unknown and little understood in this country, performance testing of furniture along with quality marking and informative labeling of furniture have become an integral part of the marketing, specifying, and buying of furniture in Europe. Presumably, systems of this nature would be of value to those who specify and buy furniture in this country also. In this, the first of a two-part series, a number of furniture research and testing institutes visited in Europe are discussed which have programs, test methods, and/or labeling systems of interest to designers and specifiers in North America. In a later article, the philosophies underlying these various test systems will be discussed and the significance of each analyzed for the design community.

Performance and Quality Assurance Testing: The Situation Around the World

Among the Scandinavian countries of Denmark, Norway, and Sweden, along with Finland, an effort has been made to develop a unified system of performance tests and a common quality assurance labeling system. Although some differences do exist from country to country, all of these countries make use of the "MOBELFAKTA" (Facts About Furniture) labeling system. In this system, which was introduced into Sweden in 1972, the functionality, the durability, and the surface resistance of the furniture along with workmanship are evaluated. Three levels of performance — basic, high, and extra high — are recognized. Results of tests are summarized on a small tag which is attached to the furniture. This tag summarizes pertinent performance characteristics so that consumers and specifiers may readily formulate purchasing decisions. Specific details of the program are discussed below in connection with the countries in which the system is used.

Sweden

Furniture research and performance testing in Sweden are carried out at the Swedish Furniture Research Institute [Mobelinstitutet(MI)] which is located in Stockholm. The Institute has extensive test equipment and carries out tests and development work on all types of furniture. The Institute is financed jointly by the Swedish government and the furniture industry through the Swedish Foundation for Furniture Research. Five of the ten members of the Institute's Board are appointed by the Government; the remaining five are appointed by the Swedish Foundation for Furniture Research which represents the interests of consumers, manufacturers, and distributors.
Presently, the Institute is carrying out studies of the function and characteristics of furniture, studies on determination of the strains and stresses on the different parts of furniture during use, and is also developing methods and equipment for determining the performance characteristics of furniture. In addition, the Institute is studying the basic principles for successful product marking and labeling and how to best present information to dealers and consumers. One of the most important activities of the Institute, however, is the testing of furniture at the request of furniture manufacturers. Some of this work is done for purposes of product improvement, although most of it is carried out for purposes of product labeling in connection with the "MOBELFAKTA" system.

Development of the quality marking and the informative labeling systems in Sweden are worthy of discussion because they have served as the model for the development of similar systems in so many other countries.

Initially, projects were started for evaluating the functions of household equipment by the Swedish Society of Industrial Design. Recommendations for the dimensions and functional design of furniture were subsequently published by the Society. Eric Berglund, who is the present head of the MI, was the principal author. Work with informative labeling began in the mid-fifties; test methods were developed and furniture was tested, and the first labeled furniture was offered to consumers and dealers.

In 1967, the present Swedish Furniture Research Institute was founded with help from industry and from the Swedish government through the Swedish Board for Technical Development. MI took over the responsibilities for test methods and consumer information and improved the informative labeling system. In developing a new system, the Institute first attempted to define a rational set of arguments for the existence of a quality mark/informative labeling system. In analyzing the problem, it was determined that such a system is of value to the manufacturer since it provides the anthropometric data needed to design a product; it provides information concerning the strength of the materials of construction and minimum material requirements; it permits a desired level of quality to be uniformly maintained; it provides a way of checking and ensuring the quality of the work and materials of subcontractors.

The system has additional advantages in that it helps the dealer to merchandise the product; it guarantees the quality of the product including its safety and durability and thereby increases potential buyer's confidence; it also makes it easier to answer questions about the product, and helps to reduce consumer complaints and makes them easier to resolve. It is also a great aid in self-service stores where the consumer depends on the quality mark and the informative label to ensure that the furniture meets his or her needs. The successful self-service marketing of furniture in the IKEA stores in Sweden provides a good example of the value of a quality mark/informative labeling system.

From the viewpoint of the consumer, the system provides the information needed to make informed purchasing decisions; it permits a rapid assessment and comparison of function, safety, durability, surface qualities, and workmanship; in short, it permits a rapid comparison of cost versus value. Furthermore, it provides a guarantee to the consumer from the manufacturer.

Out of an analysis of these arguments, the "MOBELFAKTA" system was developed and put into operation in 1972. The system operates as follows.

After the furniture is tested, the furniture manufacturer receives a detailed report indicating how well the product has performed. Since the report is usually too long to be conveniently used by the public, the results of the test are condensed and reproduced on the easily read "MOBELFAKTA" tag (Fig. 1) which is attached to each piece of furniture. The tag provides information concern-

![MOBELFAKTA quality label which is attached to furniture in Sweden. This particular tag indicates that the furniture has fulfilled the test requirements set forth by the Swedish Furniture Research Institute. It provides the additional information that the strength of the framework is high, durability of the seat is extra high, and the material quality and workmanship are high.](image)

* ISO (International Organisation for Standardization)  
  TC 156 (Technical Committee 156)  
  SC 1 (Sub-Committee number 1, Test methods)
has a detailed study underway on the fabrics used in furniture construction which is being carried out in connection with the Textile Department of the Danish Technological Institute.

The facilities of the Department are impressive. Because of its close cooperation with the Swedish Furniture Research Institute, much of the test equipment is similar to that used in Sweden (this results because the two countries have cooperated to a large degree in the development of common test equipment).

The trade association carrier for the "MOBELFAKTA" system in Denmark is the Danish Furniture Manufacturer's Association. As outlined in the introductory section, section, strength, durability of the surface, and quality of material plus accuracy of production, and workmanship are evaluated. Three levels, basic, high, and extra high, are recognized for each of these characteristics. Furniture which satisfies the requirements is entitled to carry the "MOBELFAKTA" label or tag. In addition to the "MOBELFAKTA" symbol, this tag also carries the "VAREFAKTA" symbol which is a value declaration label and indicates that further test information concerning the product is available. This latter symbol is a product of the Danish Institute for Informative Labeling. This dual labeling indicates that the furniture has passed the requirements of both a furniture manufacturer's association and an independent consumer's association. In addition to these symbols, certain items which pass the demanding requirements of the Danish Furnituremaker's Control may be allowed to carry that organization's coveted quality control symbol. The Danish Furnituremaker's Control is an organization of leading Danish furniture manufacturers who have coordinated with the WTID to formulate demands which must be met by quality furniture. Furniture which bears the black control mark issued by the organization represents the best in Danish furniture production. The control mark is the user's guarantee of high quality and signifies that the manufacturer will compensate the user in case of justified complaint.

The STD also participates in the formulation of international standards for furniture.

Norway

In Norway, research for the furniture and joinery industries is carried out by the Norwegian Institute of Woodworking and Wood Technology [Norsk Tretéknisk Institutt (NTI)]. This organization is supported by the sawmill industry in Norway and carries out research on a wide variety of wood products. To help plan its program, the Institute has committees on furniture and joinery made up of members from industry and the Institute. Technical training of personnel for the woodworking and furniture industries is carried out largely by the Norwegian National Institute of Technology [Statens Teknologiske Institutt (STI)].

Furniture Control Norway (NFC) is the trade carrier for the "MOBELFAKTA" system. It is composed of members who subscribe to the quality control program and whose factories and furniture meet the technical requirements of the organization. STI acts as the secretariat of the NFC and carries out the practical work of inspection and testing while NTI develops and revises quality standards and does research regarding both test and production problems.

Requirements are specified for quality of materials, workmanship, strength, stability, and durability, among others. Two quality grades are used: "good," which implies it is suitable for normal domestic use and "excellent," which implies it is suitable for institutional use. Presently, tests are available for lounge chairs, side chairs, sofas, tables, and shelves; tests for other types of furniture are under development.

Furniture which passes the test requirements has a distinctive "MOBELFAKTA" type quality label (Fig. 2) affixed to it along with a more detailed declaration which gives additional information on the properties of the furniture. The materials used in construction of the furniture must be clearly stated, and substitute materials and woods stained to look like other woods must be clearly identified. Participation of a manufacturer in the program implies a guarantee on his part to compensate the consumer for justifiable complaints.

Finland

Performance testing of furniture and furniture research in Finland are carried out in the Forest Products Laboratory of the Technical Research Center of Finland [Valtion Teknillinen Tutkimuskeskus (VTT)]. This Research Center, which is located in Espoo just outside of Helsinki, carries out research in many technical areas. The furniture testing facility which is located in the Forest Products Laboratory is new, attractive, and well-equipped. Furniture research is a relatively new activity in the Laboratory; current research is concentrated mainly on the determination of the functional and technical properties of furniture along with determining reasonable performance requirements. Research is also underway to develop new, improved test methods for furniture and to compare test methods currently in use.

The quality assurance program for furniture in Finland is part of an overall voluntary labeling system which is administered by the Association for Informative Labeling. In this system, the Association determines the requirements that must be met; manufac-

Fig. 2 — The quality control symbol used by Furniture Control Norway. Considerable additional information concerning the performance of the furniture is given on the back side of the tag.

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turers whose furniture satisfies these requirements are entitled to use the Finnish version of the "MOBELFAKTA" tag.

Participation by manufacturers in the program is voluntary, and a manufacturer who wishes to use the labeling system must make an application to the Association. To ensure fairness in developing tests and performance requirements, the Association is composed of members with widely varying interests who represent industry, consumers, trade, and research bodies. In addition, some governmental bodies participate in the activities of the Association. The Forest Products Laboratory both assists the Association in developing meaningful tests and setting reasonable acceptance levels and also provides a testing service for manufacturers who wish to have their products evaluated.

The "MOBELFAKTA" tests along with the labeling system in Finland are quite similar to those in Sweden. In the case of a lounge chair, for example, the strength of the framework, durability of the seat, and quality of materials and workmanship are evaluated. Three performance levels are used: basic, high, and extra high. A "MOBELFAKTA" type tag is attached to furniture which meets the requirements. This tag indicates that the furniture meets the quality requirements of the Association for Informative Labeling.

The Netherlands

Performance testing in the Netherlands is carried out at the Furniture Research Institute (Houtinstituut) located in Delft. This institute is a branch of The Organization for Applied Scientific Research (TNO) which carries out much of the research in all areas of science and technology in the Netherlands. Because the Institute is a member of this larger parent organization, it is able to follow a multi-discipline approach in its research efforts since it has direct access to the combined expertise of all the institutes within the parent organization.

Initially, the Institute patterned its tests and equipment after the Swedish model, i.e., after those developed by the Swedish Furniture Research Institute, but subsequently has developed its own unique test methods and equipment. The laboratory itself is well equipped, and tests can be carried out on all types of furniture.

The quality assurance program in the Netherlands, "TESTMEUBEL HOLLAND" (Vereniging Nederlands Kwaliteitsmerk Meubelen), was created by a number of furniture manufacturers who wanted to develop a way of calling attention to the quality of their home products when faced with competition from lower quality East European imports which superficially resembled fine Netherlands furniture but lacked its quality. The trade association carrier for the program is the Research Association for the Timber Industry (Researchvereniging voor de Houtindustrie). The Houtinstituut develops tests and establishes acceptance levels in this program, carries out tests of the furniture, inspects the factories, and monitors compliance with the program by the member manufacturers. Presently, only one level of performance is recognized. In the case of domestic furniture, the frame of the furniture is unconditionally guaranteed for five years; the fabric is guaranteed for 3 years. Furniture which passes the required tests and inspections is allowed to carry the boldly marked "TESTMEUBEL HOLLAND" tag (Fig. 3) to distinguish it from other furniture.

The program covers a wide range of domestic furniture including tables, side chairs, lounge chairs, cupboards, and cases, among others. In addition, the Institute has developed other tests for office chairs including tests for stability, backstrength, seat strength, and gas cylinder seat height and back adjustment mechanisms. The Institute is also working with the Netherlands Ministry of Economic Affairs to develop test methods for other own types of furniture, to improve quality control during manufacture, and to increase quality awareness on the part of consumers. This latter point is of particular interest since it has been amply demonstrated in Europe that honest efforts to develop quality assurance programs which provide consumers with the information needed to make rational purchasing decisions usually fail if the consumers are too indifferent to bother informing themselves about differences in the quality of the products they purchase. In addition to these activities, the Institute is also working with other European furniture research groups through the International Organization for Standardization (ISO) to develop international standards for furniture.

West Germany

Furniture research in West Germany is carried out at three institutions principally: the Wilhelm-Klauditz Institute (WKI) located at Braunschweig, the Landesgewerbeanstalt (LGA) located in Nurnberg, and the German Institute for Furniture Technology (DMT) located in Rosenheim. The WKI is one of a series of research institutes sponsored in West Germany by the Fraunhofer Society (FhG). The FhG is engaged in research and development in the fields of natural science and engineering on the behalf of industry and the federal government. The WKI works in close cooperation with the wood industry on problems of wood utilization and is also engaged in work related to technology transfer.

With regard to the furniture industry, the Institute has been involved in the development of equipment which will allow manufacturers to test and thereby evaluate their furniture. The intent is to
develop equipment that the manufacturers can use within their own plants, but the Institute can carry out tests for the manufacturers on a fee basis if desired. In addition to their work with the testing of furniture, the Institute also has projects dealing with the measurement of surface smoothness of furniture, with the finishing of furniture, and with the fire performance characteristics of furniture. At the present time, the Institute does not have or participate in any type of quality marking or informative labeling system for furniture.

The LGA, which is located in the southern part of West Germany, functions in a regional sense for the state of Bavaria, but presumably can also test furniture from all over Germany. Furniture testing is carried out by the Furniture Testing Institute (Mobelprüfungsinstitut) which is a part of the LGA. The Institute is an outgrowth of the Institute for Product Testing and Quality Control (Institut für Warenprüfung und Qualitätsüberwachung). The Furniture Institute has a large, well-equipped laboratory — perhaps the largest in existence which is dedicated solely to furniture testing — and it has developed test procedures for essentially all types of furniture. Certain types of furniture must be tested by law in Germany to determine if it meets safety requirements, but much of the furniture is tested by the Institute for manufacturers on a voluntary basis. Furniture which meets the requirements set by the Institute is entitled to carry the DM quality mark. Only one level of quality is recognized.

In all of its testing, the LGA functions as an independent neutral third party which may carry out tests for manufacturers, consumers, and the government. Results of its tests may be used in court to settle disputes, and it is, in general, highly regarded by all parties.

The German Institute for Furniture Technology (Deutsches Institut für Möbeltechnik (DIT)) was founded in order to systematize furniture testing and development. The Institute was formed and is supported by the various furniture manufacturers and trade associations in Germany and serves the nation as a whole. Furniture which passes the requirements established by the Institute may carry the 'GS' seal. Although the Institute was only recently formed, it has already moved into its own spacious quarters where tests equipment along with appropriate tests are being developed for all types of furniture. Current research objectives of the Institute include fundamental investigations into furniture construction technology and corresponding material and performance testing, cooperation in the development of national and international standards, and development of safety technology through testing. In addition, the Institute is collecting and analyzing generally recognized performance requirements which must be met by the materials used in furniture construction as well as by the furniture itself. The Institute also provides training in safety and advanced training in furniture science.

France

Furniture research and testing in France are carried out and administered by the Centre Technique du Bois which is located in Paris. A voluntary labeling system is administered by the Centre in which tests developed by the Centre are carried out to determine the strength and durability of the furniture along with the characteristics of the fabrics and the finish. Only one grade of performance is recognized. Furniture which passes the stated requirements is allowed to carry the "NF" symbol of quality.

Great Britain

Furniture research and testing in Great Britain are carried out by the Furniture Industry Research Association (FIRA) which is located in Stevenage, England. FIRA arose from the activities of the Furniture Development Council which was formed in 1948. This institution was financed by a statutory levy on the manufacturers of domestic furniture. The Council was concerned primarily with the promotion of scientific research related to furniture, the collection and dissemination of technical information, and with management activities in general. Over the years, work in these areas increased until it became the major activity of the Council. In 1961, FIRA was formed to take over these activities.

FIRA is financed by the statutory industrial levy along with subscriptions from certain manufacturers of office and educational furniture suppliers to the industry, design organizations, colleges, and large purchasers and users of furniture. Some projects are also supported by the Government. FIRA is supported, therefore, largely by and functions for industry. It is not a consumer or user oriented organization and does not issue quality labels or carry on a quality assurance program.

FIRA has developed numerous tests and associated equipment which may be used by its members to qualify furniture for given end uses. In its tests, FIRA analyzes the strength and durability of the framework of the furniture, evaluates the seat and back foundation systems and the fabrics, and also evaluates the quality of the finish and its resistance to common solvents and other common household agents. Basically, five grades or levels of performance are recognized in these tests. They are not cumulative type graded tests, however; rather, the furniture is subjected to a unique set of tests for each grade level.

The tests developed by FIRA have been incorporated into British Standards, and hence any user of furniture may require that furniture be tested or guaranteed to meet the requirements specified.

In addition to its domestic work, FIRA also participates in the drafting and formulation of international standards.

The United States

Although numerous furniture research projects have been carried out at various institutions over a period of time, there are today perhaps only two institutions in the United States with clearly recognized furniture programs: North Carolina State University at Raleigh, North Carolina and Purdue University at Lafayette, Indiana. The furniture program at North Carolina State University deals largely with furniture manufacturing and management. It is supported strongly by the Southern Furniture Manufacturers Association, and one of its principal goals is to train graduates for the furniture industry.

The Furniture Research Center at Purdue University, on the other hand, traditionally has been primarily concerned with the strength design of furniture. Most of the research, accordingly, has dealt with how to design furniture for strength and durability and the development of tests to evaluate these properties. Support for the program has come largely from grants from the federal government, private associations, and individual manufacturers. The program is quite unusual in that similar research is carried out at very few institutions throughout the world. Recent formation of the Environmental Design Institute at Purdue University with its anthropometric, ergonomic, and behavioral research capabilities has greatly expanded the scope of furniture research which can be undertaken at Purdue through the interdisciplinary interaction of the two organizations.

Performance tests for furniture have been developed principally by three groups in the United States: a) The Business and Institutional Furniture Manufacturer's Association (BIFMA) which is located in Grand Rapids, Michigan, b) The National Kitchen Cabinet Association (NKCA) with headquarters in Louisville, Kentucky, and c) The National Furniture Center (NFC) located in Washington, D.C.
As the name implies, BIFMA is concerned only with office furniture, and it has developed or is working on standards for lateral files, vertical files, desks, chairs, flammability of materials, and panels. Once developed, these standards are submitted to the American National Standards Institute (ANSI) for acceptance and promulgation. Although the standards developed by BIFMA were developed for office furniture, they would also be expected to apply to certain types of domestic furniture. The proposed lounge standard, for example, would be expected to apply equally well to sofas used in the home.

These standards are developed by committees working within BIFMA in which the combined knowledge and testing results of the members are pooled in order to obtain a consensus document. Outside consultants and advisors are used when needed.

The tests used are basically of a "go/no-go" type in which the furniture is subjected to a functional and a proof load. Acceptance criteria are usually based on safety considerations. In the case of office chairs, for example, acceptance is based on whether or not sufficient damage has occurred to the chair to make it unsafe for use.

Recommended minimum construction and performance standards for kitchen cabinets were first developed by the NKCA as part of its kitchen cabinet certification program. Subsequently, these requirements have been incorporated into an ANSI standard.

In general, the test method calls for an inspection of the quality of workmanship including the fit of the joints, resistance of the panel edges to water, resistance of the surface finish to various agents, and mechanical strength tests of the cabinet and its parts. These tests are basically "go/no-go" type of tests which prescribe minimum performance levels.

The National Furniture Center which is a part of the Federal Supply Service is responsible for writing specifications governing furniture purchased by the federal government. Most of these documents are detailed specifications which specify exactly how the furniture is to be made and how it is to look; some of the standards also contain performance testing provisions which, in general, are of a "go/no-go" type. Two exceptions are the performance tests which have been developed for evaluating the frames and the seat and back foundation systems of upholstered furniture. These standards, which were developed at the furniture research center at Purdue University for the NFC, are based on a graded system of tests in which the furniture is tested to destruction. In such tests, the key structural indicators of strength and durability are first identified. The furniture is then tested to destruction by means of cyclic tests in which the loads are periodically increased to determine the degree to which these performance characteristics are present. The value of this type of system lies in the fact that the performance characteristics of one piece of furniture can be compared directly with that of another. The same graded performance test concept was also used by the furniture research center at Purdue in evaluating chairs to be used by air traffic controllers. Unfortunately, the tests developed for these chairs (which are, in fact, heavy-duty office chairs) have not been incorporated into a standard performance test method.

Other Organizations

In addition to the organizations described above which were visited during trips to Europe in 1977, 1978, and 1980, furniture research, testing, and quality assurance programs are being carried out and administered in institutions in many other countries around the world. In Europe, quality assurance programs are also being administered in Belgium and Austria. Furthermore, extensive furniture research is being carried out in the East European countries including Rumania, Bulgaria, Yugoslavia, Czechoslovakia, Hungary, Poland, and East Germany along with the Soviet Union. The amount of furniture research carried out in these countries is impressive, and many fine papers have been authored by researchers there. Two quality levels have been developed for these common market countries—the lower grade is for furniture used at home, whereas the higher is for furniture for export.

Other countries including Australia have looked at quality labeling, but at present they have not developed a system. Japan also has and is carrying on considerable furniture research but as yet does not have a labeling system.

Although it does not carry out furniture research, the efforts of the International Organization for Standardization (ISO) to develop standards for furniture justifies mentioning because many of the test methods defined in the standards are based on the research and tests carried out in the various participating countries. Development of standards for furniture in ISO is being carried out by Technical Committee 136. Each country, or in some cases a group of countries, has responsibility for a given area. The nine sub-committees (SC) of Technical Committee 136 are divided as follows:

- SC 1 Testmethods (Secretariat: Sweden)
- SC 2 Ergonomics (S: vacant)
- SC 3 Material Properties (S: W. Germany)
- SC 4 Terminology (S: Rumania)
- SC 5 Domestic Furniture (S: W. Germany)
- SC 6 Office Furniture (S: France)
- SC 7 School Furniture (S: W. Germany, Nurnberg)
- SC 8 Hospital Furniture (S: Sweden)
- SC 9 Hardware (S: France)

At present, the United States is not participating in the development of these standards.

Performance and Quality Assurance Testing: Summary

It should be evident to the reader that there are sufficient opportunities throughout the world for product testing that it should not be overly difficult for a designer to obtain the factual information needed to make rational purchasing decisions. Performance and quality assurance testing is a method of pre-assessing product functionality. Such a process of "Functionality Testing" has several apparent advantages which will be discussed at length in the second of two articles by the authors; it seems appropriate, however, to discuss a few of these points at this time.

Functionality testing provides the product manufacturer with the anthropometric data needed to properly design a product; it provides data concerning the strength of materials and minimum material requirements; it permits a desired level of quality to be uniformly maintained and it provides a way of checking and maintaining material quality levels and the workmanship of subcontractors. Furthermore, it provides a means of stating furnishings quality in objective terms.

For the designer, functionality testing means reliable information for optimal comparison and effective specification. It also may have an impact when specifications must be sufficiently rigid in order to minimize designer liability in situations of product failure in use.

Functionality testing facilitates product merchandising for the retailer and provides an implicit guarantee for quality, safety, and durability of the product.

For the consumer, it provides the information needed to make rational purchasing decisions. It permits an assessment of function, safety, durability, and workmanship and greatly increases consumer confidence.

This first article has provided a survey of performance testing and quality assurance programs in use around the world. In a subsequent article, the authors will discuss the underlying philosophies of performance testing and quality assurance programs along with the apparent advantages and disadvantages for the design community.
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In addition to the general references given above, each of the organizations discussed has issued numerous publications dealing with test methods for various types of furniture. Furthermore, the standards-making bodies of many countries including those just discussed have issued standards and specifications which relate to furniture. The number of such documents runs into the thousands.

Selected References

Definitions
Performance tests: Tests which are used to assess how well a piece of furniture may be expected to perform in service. Ordinarily, these tests simulate to some degree the conditions and use which might be expected under normal conditions of use.
Go/no-go tests: Tests which do not differentiate between different levels of performance; rather, they set minimum levels of performance which must be satisfied.
Graded performance tests: Tests which differentiate between different levels of performance.