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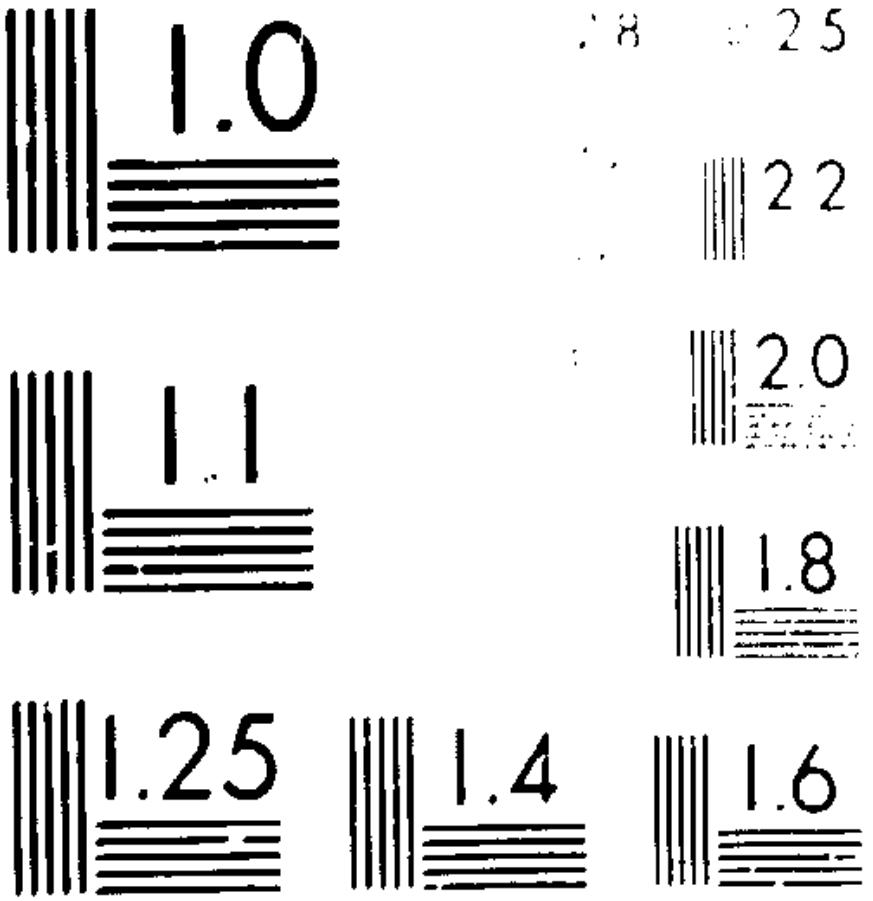
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United Nations Industrial Development Organization

Distr.
LIMITED
ID/WG.390/14
14 March 1983
Original: ENGLISH

Workshop on Technical Appraisal of Public
Sector Mechanical Wood Processing Industries
Ljubljana, Yugoslavia, 11 - 23 April 1983

QUALITY CONTROL OF FURNITURE 1/

by

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V.83-53399

INTRODUCTION

In the course of the growing tendency of the various national economies to attain the European and, in perspective, the world level in the quality of their production, requests for laboratory testing are increasing. The drive for quality arose from need, seeing that competition on the markets, primarily foreign, is in the closest connection with this notion. Permanent quality control of production is a valuable advantage with which to face the market, and for this reason guarantees are desired for quality control activities, these are attainable only when the necessary laboratory tests can be made. Appropriate testing and certifying institutions or centres fill this need; they are suitably equipped and manned by technically trained and experienced personnel. Only such institutions or centres can be expected, by both producers and consumers, to carry full responsibility for their statements.

Demand for quality control is growing from both consumers and producers. Rising living standards and the ever increasing variety of supply result in newer and greater difficulties in securing a share of the customers' purchasing power. It is thus quite natural that the quality and design of products exert a prevailing influence. Product design is directed to taste and fashion, for which no impartial methods of measurement exist. But, for the materials utilized and the degree of technical perfection attained, some basic conditions and also other more demanding ones (eg. the quality mark) can very clearly and exactly be defined, conditions which every product must meet to suit a particular quality standard. As an example, the practical extent of the influence of control by an independent testing laboratory on the quality of products can be pointed out. Different producers might use in their production programme the same raw materials, semi-manufactured products, etc., but on account of the different technologies used in their plants and of the differing professional and technical capacities of their staff and labour force, never produce goods of the same quality.

It is obvious that quality control can never only be the duty of the producer, and that, for example, control systems must be applied to furniture so as to declare the qualities offered to the customer. Such control can only be carried out by an impartial institution, staffed with personnel trained in testing and equipped with appropriate laboratories.

Many countries (specially in Europe) are today occupying themselves intensively with this problem. Some already dispose of quite exhaustive solutions for the organization of systems of control, that have already shown good results in an experimental phase. Such control systems have proved satisfactory to both producers and consumers. New approaches in countries with a long industrial experience demand that standardization activities must necessarily be coordinated with the study of the consumer and his own standards (ergonomics) and wishes, or, in other words, with the functionality of the product. A combined activity of all the sectors that participate in any way in the determination of the quality of furniture would help towards creating a responsible information system, a system of classification and also lead to maximum technical change, resulting in gains in product quality and eventually to economic gain as well. An improvement of quality would be made possible, enabling higher trust in the work and services done, and restricting speculation and thus facilitating international trade.

QUALITY CONTROL IN THE WOODWORKING INDUSTRIES

The Significance of Quality Control

Products of the woodworking industry, especially interior equipment and household furniture, are reaching our market in increasing quantities. This is attributed to the continuous rise in our manufacturers' production capacities. A widening of the range of items offered has followed closely, although products of the same designer or the same design, produced in quantity by various manufacturers also appear. Such products are alike in appearance, but not in the quality of the materials used or in the quality of workmanship. The differences in quality between products of the same manufacturer are sometimes surprising, since they are produced in the same factories with exactly the same technologies. The usual faulty goods which are part of any production process and are all the more to be expected when wood and wood materials are concerned are not intended for sale. The extent of faulty pieces to total production can be calculated statistically in advance and expressed in percentages. In spite of this, additional faults in the assembly and construction of materials might crop up. These cannot be envisaged by the otherwise correct statistical calculations, accruing from objective difficulties in working on the basic material and semi-manufactured products.

The basic raw material of the woodworking industry is still wood, whose structure, being that of a product of living nature, is not homogeneous and can never be as predictable as, for example, the materials used in the metal or construction industries. Materials used by these industries might also be of differing inner structures, but will at least have sufficient homogeneity to enable the making of whole series with equal properties when derived from a same source.

Wood is different,the difference accentuated by its individuality represented by the fact that even individual specimens of the same tree species will sometimes show great differences in anatomy and chemical structure. These changes are mostly under the influence of outside factors such as: location, climate, height above sea level, etc., which determine wood formation during the time of growth and development of the tree. It cannot be ignored that even the most minor variations in some of these influences will leave a trace on the individual tree, later to become the raw material for the woodworking industry.

If this is the case for a single species then the differences among the different species can be envisaged all the more easily. We are sometimes not sufficiently aware of these facts and will machine wood or treat it chemically in an irresponsible manner, i.e. without prior testing. Quite often, the same techniques are applied, as if there was no difference between the various species.

Aside from the basic raw material (wood), final products of the woodworking industry also contain materials produced by other industries, for example the chemical and metal industries. Products of the chemical industry are the most typical. Considering the large number of glues, staining, finishing and protection substances and others that the chemical industry is supplying, the essential question comes up as to whether these substances can be considered universal and applied successfully for any purpose. This is where the wood engineer steps in. It is his task to chose, among the products the other industries are sending in, those best suited to the particular wood species and wood materials used in production.

Of course the wood engineer cannot give prescriptions and recipes for the products of other industries. His job is to apply them, he must have a good knowledge of the products used, especially of their structure. Only thus will he be able to decide - knowing, as he does, the basic material wood - on the possibilities of combining the given material with wood. The question of possible combinations should, by all means, be cleared prior to utilization, so as not to take action only when a mistake has already been made. It is most unfortunate that the large part of these mistakes can then no longer be remedied, resulting in a total loss, both financial as well as loss of reputation with the customers. The loss of reputation can sometimes mean more than mere financial loss. A good name is easy to throw away, but hard to come by.

Customers today do not wish to buy products of dubious value. On the other hand, producers are equally interested to know just what the market is justified to demand of their products. The development of the market and of production has therefore led to an intensive search for the possibilities of agreeing on certain standards to regulate the demand for quality.

Product quality is of rising importance in the contemporary world. Competition on the domestic and international markets is growing steadily stronger, quality control has therefore become of increasing significance to the national economy, most of all from the point of view of participating in the international division of labour. Correct measures should be discussed, which will enable producers to join in the world competitive struggle. The care for quality does not rest only on the work organizations which produce the various goods or render the various service, but is increasingly becoming the care of the whole society. The time is over when the opinion prevailed that quality control was something to be organized and taken care of only in the productive sector, and not in the other phases of product manipulation as well, i.e. all the way from the producer to the final consumer. In Yugoslavia, we still have very few acts that regulate and determine the quality of products of the woodworking industry - especially the furniture industry. Some dozens of standards have been issued in this field, which however need further elaboration. Apart from the standards for dimensions, needed in the installation of particular elements, technical goods and products of other industries, we also need more fully defined standards for the quality of these products.

In spite of these demands and their obvious logic and necessity, these standards have already been criticized, changed and even annulled. The use of standards in the woodworking industries, specially in the field of furniture is strikingly insignificant. In Yugoslavia, it has still been possible, through special arrangements, to avoid regulations: a possibility that the producers made much use of. The main reason which allowed the development of such a state of affairs was the unrealistic regulations themselves which hindered production instead of promoting it further.

Development trends

It is very important for the producers of furniture to choose the most suitabie level of quality for their products. Quality policies must also be pursued by particular groups of producers or by all the producers of a country; they must select those that will be the most beneficial to the development of the selling capacity of the companies.

The question of the contents of the concept of quality merits consideration:

We can talk of technical quality, meaning a well executed production and rigidity.

We can talk of use quality, discussing the adaptability of furniture to man and the environment.

We can talk of design quality, judging the appearance of furniture.

Every one of these aspects of quality can be significant for an enterprise planning its production.

The choice of the level of quality of the furniture is important for a number of reasons. The technical equipment of a company, its organization and capacity must correspond to the quality of the furniture selected to be produced. The policy on quality is also a decision on the intended type of customers, thus also determining the size of the market. The choice of design and technical quality can determine the future life of the company.

What are the existing development trends in the various countries? Can an overall rise or fall in the levels of quality be discerned? The answer is that the choice of furniture is today everywhere much more diversified than it ever was, and that there is still a great need for a yet wider variation of the assortment and for yet more specialization amongst individual producers.

Changes affecting the needs and attitudes of consumers on prices and quality of furniture, can be explained by the continuing social changes:

- The overall economic development affects the purchasing power of the various social groups.

- Social and cultural development influence habits and value systems and change attitudes to the significance of the environment and furniture.

- Changes in the structure of population: A rapid growth of the number of older people is evident.

- Technical advance, introducing new materials and processes changes the properties of furniture.

- The scope of building construction also affects the buying of furniture. What is the extent of the construction of homes, country houses, public and industrial buildings?

- Developments in trade policy: customs duties and trade agreements affect imports and exports.

- Regulations, for instance trade regulations, safety measures, national and international standards, etc., influence the various demands on the properties of furniture.

- The development of mutually competitive groups of goods and services can lead to the consumer spending his money on things other than furniture.

Tasks for Quality Control

The tasks of quality control are quite numerous. Today, in the age of complex and integral quality control, it must be active in all fields, from the defining of needs and wishes, to design, creation and the utilization of the final product. Efficiency and economy are demanded of quality control, as well as adaptation of its methods and techniques to the conditions of its application.

The methods of quality control can, according to some authors, be differently expounded. Control can be carried out:

1. During the fabrication of the product, laying special stress on the permanent attention to quality already during production - this is prevention; and

2. At the time when the product is already finished, at which point the purpose of control is the determination of the level of quality and safety.

The first group can be said to consist of definition, design and introduction of quality into the product. We therefore attend to quality during the very process of production, applying preventive methods of control Several methods suit this purpose, as for example: occasional control alternating or permanent control, depending on the technical rythm of the process, on the productivity of the machinery and on the economic and technical parameters. Permanent control has most certainly better preventive functions than when done occasionally, as the quality of production is tested on the spot, systematically, permanently, at determined time intervals, submitting to quality control during the technological process. On their rounds, the controllers enter their observations on quality characteristics into statistical control cards and sheets, specially prepared to give immediate visual notification of any shortcomings.

The second group of methods might be termed acceptance control. Quality is introduced in the design phase and this inspection is the actual confirmation of the quality, although confirmation is on the finished product. Methods are used with more or less efficiency - depending on the quanitites of products - that open up new possibilities in quality control in the technological and economic perspectives. Following a permanent and systematic attention to the market and specially to consumer wishes, programmes and projects evolve which are indispensable for the fulfillment of the needs and wishes of consumers, while this same fulfillment of goals also ensures the good performance of the producers concerned.

Development and construction represent the first phase in the introduction of particular programmes. The quality of construction depends on the characteristics of the products, defined by the construction and technological specifications. So perceived, the quality of construction will reflect the personal and professional capacities of the constructor in relation to the needs of the consumer. A choice of the right suppliers of materials and equipment and of the correct technical and technological organization of production, together with a choice of proper distribution, might, in some cases, be important factors of quality and of the efficient running of business. Every business enterprise must make efforts to examine closely and solve, in the phase of programme elaboration and construction and technoligcal documentation, the problems of an equal quality of these components of integral quality, for only through such preventive action can it improve the quality of its products and in this connection its overall operations.

The general purpose of all activities are aimed at the greatest possible assurance of inegral quality, starting from market research and product design all the way down to execution and utilization, is in the assurance of the use value of the product and of the necessary conditions for the realization of this value in the process of the conditioned needs in the ambient sphere in which it will be used. If we agree with the above propositions, then an industrial product of quality can be taken to mean a combination of its properties, accruing from its usability and contributing to the necessary quality of the product, all the while proportional to its market value.

In contrast to the market concept of quality, a technical-technological concept is also feasible. This term most often denotes the degree of quality determined by the breakdown of quality characteristics as included in the construction and, technological specifications. It can sometimes lead to the erroneous opinion that quality can, in he wider sense, also be measured on a basis of bad specifications.

Approaching analytically the previously mentioned components of integral quality it will be discerned that the quality of a product can be successful in the technical-technological sense and that it can also be quite strictly established and kept under observation, only if quality is successfully solved within the programme and during manufacture. Whence the need for every modern enterprise to direct its main efforts concerning the problems of quality to the above-mentioned first phases, for only then can permanent quality be maintained in the poduction process.

From the above, it can be clearly seen that quality will be a function of the activities of the whole enterprise - from market research and defitition of the quality demanded by the market, through development, production and the technological process down to packaging and transport of the product. The coordination of the various responsibilities for quality and the various activities employed in the process concerning new products as well as further promotion or at least prevention of decline of the existing production is essential for the successful execution of all these tasks.

Each service and sector has its own responsibilities in doing their task, and should not meddle into the affairs of others; decisions should be independent and carry full responsibility. A common purpose of obtaining quality does however run thorugh the various activities, linking them to each other. Product quality can be accepted on the market only if the product is endowed with all the elements of quality - functionality. appearance, form, durability, etc. The manufacturing process, costs of waste, finishing, etc. will have an influence on the price as well, but it also includes the elements of quality An element of quality is also the suitability of the element, where the option is given of changing a part of the product or all the product. Various elements for assembly enter this category, all of them result of manufacture and technology, but in a wider sense only elements of

the quality of the product. For this reason, it will be best for quality and quality control to be simply the coordinator of all the jobs and processes, to keep it away from the work of others, but to be there at all phases so as to assist the activities which determine quality and to remind all concerned of the requirements.

The subject of integral quality control is too extensive to be treated in one short session and too complicated to have all its phases led by experts with a similar profile. Cooperation between experts having different professions is necessary, but their work must all the same have a common purpose and pursue the same end. There is even the possibility of particular phases to be worked on and managed outside of the enterprise, with the cooperation and assistance of outside institutions. Such forms of control can be utilized as a form of acceptance control or final control, when independent persons assist in establishing the quality of the materials used, the quality of manufacture, rigidity, durability, stability, etc., bearing on the mechanical elements of the testing of quality. Thus, the resistance of varnished surface is tested to water, coffee, tea, grease, ink and also to end use, etc.

The aim of these deliberations has therefore been to assess the problems as clearly as possible, taking into account all possible past experience, and to employ quality control with all the seriousness it merits. We must think over the options for improving the organization of the service of quality control in our own enterprises and the actions that need to be taken for this purpose. An analysis of the conditions existing in the enterprise will help in the planning of the activities needed to ensure successful integral quality control in the near or perhaps somewhat more distant future.

The following basic principles must be satisfied to obtain the best possible quality control:

General demands on quality

- The product must answer all significant demands that represent the complexity of the properties of the product and thus express quality; the exposure of only particular characteristics of quaity is not enough.

- The demands on the product must consist of a set of parameters that are objective (measurable material, technical and physical units) and subjective (descriptive qualities bearing on comfort and social position) in nature; stress is to be laid on the objective parameter demands, which should also be weighed appropriately.

- The demands must be realistic: suited to the technique of production, economically attainable and favourable to the consumer, the level of quality should therefore be adjusted to the level of development of the society and to the needs arising therein.

- A permanent level of quality is to be maintained with the company's own control organization (direct control) and with parallel supervision by a neutral outside testing organization (indirect control).

Extent of the tests

1. Direct control:

- assessment of the constructional elements and materials, and determination of quality prior to the start of the production process;

- control of the various production points that bear decisively on the uniformity of quality (drying, laminating, glueing, sanding, etc.)

- control the precision of the working of elements and assemblies (according to a schedule of permissible deviations from the norm);

- control of the function of the product (simple tests feasible outside laboratory conditions).

Frequency and criteria for the checks are set for all controls. In all the four fields records are maintained for every particullr production task.

2. Indirect control:

- supervision of all the phases anticipated by direct control observations; two unannounced yearly inspections.

- withdrawal of finished products from production (once yearly) to undergo testing of technical properties in a laboratory (functionality, safety, mechanical rigidity and durability, resistance of surface).

The testing organization delivers the final report to the quality association.

PROPOSITIONS FOR THE CREATION OF QUALITY CONTROL OF FURNITURE IN LABORATORIES

The methods of researching the quality of furniture described below have been established by drawing on the wide experience already obtained by research workers in foreign and Yugoslav institutes. They are also the results of cooperation with a large number of professional workers employed by the companies themselves, thus enabling us to talk of actual methods and means of testing furniure. The experience on which the proposed testing rests has come from a number of countries such as Sweden, Denmark, Norway, France, Great Britain, the Federal Republic of Germany and others. All this will safely enable us to make these methods a basis for the elaboration of standards for the research and control of the quality of furniture.

Methods for the research of the quality of the finished product, in our case furniture, which should also serve as guarantees for the given level of quality, are divided into four main groups:

- methods for the determination of the rigidity and durability;
- methods for the determination of the usability;
- methods for the determination of quality of materials used and quality of the manufacture;
- methods for the determination of the quality of surface treatment.

The first two groups of methods can hereafter be treated together, as usability methods include - apart from the prescription of dimensions, based on the findings of ergonomics - only safety regulations, concerning in most part stability. Considering that stability is often a condition of the rigidity and indirectly the durability of a product, this simplification of the system of testing is justified.

METHODS FOR TESTING THE VARIOUS GROUPS OF FURNITURE

1. Sitting furniture:

Included here are products whose basic use function is to be sat on. Chairs and armchairs, with or without arm rests are included, one-seat, two- and three-seat combinations, etc. The rigidity, durability and stability of sitting furniture is tested (see Annex I).

1.1 Establishing the quality (rigidity) of the kitchen chair without back rest, and of the bench.

1.2 Establishing the quality of chairs and armchairs.

1.2.1 The quality of chairs and armchairs without arm rests.

1.2.2 The quality of chairs and armchairs with arm rests

1.2.3 The quality of children's high chairs.

2. Bedding

Mostly, methods for the testing of ordinary beds and children's beds are known. The testing itself is in the first place directed to:

- tests of the construction of bedding.
- tests of the durability of bedding.

2.1 Testing he quality of beds.

2.1.1 Testing the construction of beds.

2.1.2 Testing the durability of beds.

2.2 Determining the quality of children's beds.

3. Furniture for working and eating:

Rigidity, durability, and stability is tested on tables, which make up a large part of this furniture. In the case of the given product, the table, also consisting of drawers and shelves, these should be tested according to the system for testing these items whose methods are treated in the paragraph on furniture for storage.

3.1 Testing tables.
3.1.1 Testing the rigidity of a table.
3.1.2 Testing the stability of a table.

4. Furniture for storage

All kinds of large wardrobes, showcases, chests of drawers, cabinets, etc., belong to the group of furniture termed furniture for storage. Methods for determining rigidity, durability and stability of these products can thus be common to all pieces, for we are in all cases treating a body that must be of sufficient rigidity and soundness of assembly not to be shaken apart by pushing and moving. This type of furniture is also subject to the testing of the rigidity of shelves and to establishing the suitability of the force required for drawing and pushing drawers.

Other common standards for furniture:

1. Methods by which the quality of materials and of fabrication is determined.
2. Methods for establishing the quality of surface treatment:

   A. Determining the resistance of surfaces to liquids.
   B. Determining the resistance of surfaces to chemical substances commonly used in households.
   C. Determining the resistance of surfaces to heat;
   D. Determining the resistance of surfaces to mechanical forces;
   E. Establishing the physical properties of surface treated furniture components.

QUALITY CONTROL SYSTEMS FOR FURNITURE

A higher quality means the assurance of permanency of above average quality of production levels and of above average levels of quality of the final product. To assure the permanent quality of products, a system is needed to enble efficient and continuous observation and assessment of conformity to the determined level of quality; and a system to give social and public verification of the quality achieved.

This chapter will analyse the various questions connected with the establishment and the operation of the system, such as:

- what organizational interventions are required for the creation of an all-round system of observation, assessment of conformity, and allocation of rights accruing to higher quality.

- what are the leading notions of the individual and common unifying interests (image, economic determination of the levels, use value for the consumer);

- how systems function with respect to legal regulations (administrative organs, technical bodies, rights and obligations, etc.);

- where are the demands and conditions that shape the higher quality level directed (compilation of a catalogue of demands);

- where are the control activities directed (mostly into direct control within the production process or mostly into indirect control in institutions).

To obtain the largest possible number of answers, we surveyed the ways by which these questions are being solved in the most developed countries of Europe and especially in thoe that have established a quality label for furniture. The survey took into consideration: Austria, the Federal Republic of Germany, Sweden, Norway, Denmark, France, the Netherlands, the United

Kingdom, USSR, the German Democratic Republic and the USA. The analysis should serve as a starting point for the proposal of a possible system for Yugoslavia (sketched out on the last pages of this text), adapted to our socio-economic conditions.

BASIC TYPES OF SYSTEMS AND MARKINGS

The existing national and branch systems

The analysis showed a great variety in the basic types of systems which also include furniture. Systems differ from country to country, reflecting particular socio-economic requirements. The various policies and interests for the promotion of the quality of products and services concerned are: considering the interests of affirming good furniture it is evident that in some countries common and general interests have strongly prevailed, organizations there having been set up to manage the system on a national level; while in some other countries the promotion of qulaity is treated partially, individual companies attempting to assert their own trademark, or individual testing organizations or associations attempting to group the greatest possible number of producers into partial (grouping systems) branch products relations products, special products, establishing their own attestation mark or quality label.

With respect to furniture. the legal option of the collective trademark is generally made use of, its outside marking being the quality label, or the attestation mark, or a combination of both. In some countries, the label attesting conformity to standards has been applied.

European systems can be classified into five main types:

1. Collective national trademark; the central managing and administering body is the association for the promotion of quality; régimes of direct and indirect control; marking with a common quality mark with the statement "attested", and a graphical notification of the product group added.
   Country: Austria.

2. Collective national trademark; central management by the RAL or ganization; quality associations for individual product groups are actually in charge; régimes of direct and indirect control; marking with individual product group's quality marks with the note RAL.
Country: Federal Republic of Germany.

3. Collective national trademark; the standardization institution is in charge; it also manages the system; régime of only indirect control; marking with individual product group's marks of conformity to standards:
Countries: Federal Republic of Germany, France, German Democratic Republic and the USSR.

4. Collective branch trademark; the authorized attesting organization is in charge; régime of only labortatory indirect control; marking with an attestation label, with a declaration of quality added.
Countries: Sweden, Italy, Great Britain (the latter two without the declaration).

5. Collective branch trademark; the authorized attesting organization is in charge; régime of only indirect control; marking with a quality mark, with a declaration of qulaity added;
Countries: Denmark and Norway.

Where activity for the promotion of quality is centralized at the national level, special independent organizations exist (the RAL in the Federal Republic of Germany and the AFöQ in Austria) which manage the whole system. Where only conformity with standards is required, the system is managed by the national standards institutions (AFNOR for France and DNA for the German Democratic Republic). In case where only collective branch trade-marks bearing the quality label are legally pracciced (Denmark and Norway), the managing bodies of the system appear in restricted form. In cases where quality is marked with the attestation mark (Great Britain, Italy and Sweden), the system has no special administrative or care-taking bodies, this being simplified and the allocation of rights of usage of the label is given tc the attesting organization.

In countries where the quality mark assumes the role of the national quality trade-mark, the régime of assessment of permanency of the level of quality is connected to a twofold permanent control:

- direct, applied by the producer in the course of the production process; and

- indirect, applied by the quality association (verification of the conditions of organization of the producer), and by the authorized attesting organization (supervision of the reliability of direct control and testing in laboratories).

This way, a many-sided system of supervision of the fulfillment of conditions of quality is ensured, with a multi-level responsibility for the reliability of the data produced. Of special importance in this system is the inclusion of the producer into the control system, for his own responsibility to carry more weight. Practical results achieved in the Federal Republic of Germany and Austria are ample proof of the full justification of the inclusion of direct control and the producer's own engagement. We are of the opinion that systems which do not include direct control cannot be complete as they are all too often prone to disturbances arising from different causes (on the very notion of attested quality, on transferring responsibility to outside factors, on costs outstripping the margin of economical quality, etc.).

An appraisal of the orientation of quality demands and conditions between the five main systems will show a common tendency to encompass the largest possible number of demands of an objective nature (because they are measurable technical and physical units). The majority tries to avoid demands of a subjective nature (registration of faults by observation, assessing the appearance and attractiveness of the product); which can best be pointed out on the example of Sweden where the evaluation of characteristics is tied closely to the mechanical properties of the construction and surfaces of the product, with other representative properties much less expressed or rather unsuited to practical assessment. It is absolutely necessary for the catalogue of demands to satisfy the conditions that apply to safety in the functional use of furniture (toppling from normal position, falls from seats and beds, injuries due to badly worked out details).

If quality demands in the catalogue were to be directed to only a few key technical characteristics, this would not suffice for a full representation of high level quality. The demands must obviously reach deep enough to touch all the typical characteristics through whch the product expresses its multiple functionality as well as its complex appearance (use of materials) and precision of fabrication. The level of quality demands (criteria) snould however be realistic, suited to the technique of production, economically attainable and favourable to the consumer. It should therefor be adjusted to the level of development of the society and to the needs arising therein. Entry into the high level is freely decided on by the producers themselves, their overall business policies including the choice of the quality level through cost analysis calculations.

The degree of reliability of the usefulness of a given quality mark depends to a large extent on what is included and how evaluations are made. The markings "Quality", "Attestation", "Conformation label", should not lead us to imagine that the complete technical and legal usefulness of the mark is represented. We have noted that generalizing comments on the degree of reliability are often expressed even by experts, which gives the public the notion that these markings express complex valuations only if they are backed by a renowned testing organization. The mark "Quality" or "Attested" might apply to just one quality characteristic, tested on a sample item only once a year.

An analysis of the component parts of the whole system of quality assessment is therefore needed to get answers on the degree of reliability of any given mark. In the above description of typical European systems, we presented the basic facts on which to differentiate (extent, direction and weight of demands; extent and types of tests, observation and control; degree of definition of testing methods; types of sampling and frequency of testing; extent and criteria of legal regulations), while details on the degree of reliability are given in the following chapters.

Establishing international systems

The description of the typical European systems of quality assessment and marking has shown the heterogeneity involved and one that burdens the

international division of labour and international marketing with difficulties in differentiating among products and in comparing quality. The first step to improve these conditions should be the standardization of testing methods, and a compilation of the demand specifications to follow.

Problems of international testing systems have also been taken up by the International Standards Organization (ISO). A committee (ISO-CERTICO) was formed some years ago for the study of these problems; all the concerned international organizations (among them consumers' organizations) were invited to collaborate with it. The committee has so far produced a system of regulations for conformation standards, to enable, in the first phase, unified treatment in the member states. A manual for the functioning of testing systems is presently being prepared.

Tendencies towards the formation of an international testing system are also strong in member states of the European Economic Community (EEC). Of significance are also the efforts of the Economic Commission for Europe which has, in its programme of meetings of government representatives for standardization, lately included questions on the setting up of an international organization for the supervision of quality. The docments of ISO-CERTICO (Certificate-coordination) will also guide us in this text in our propositions for a system for Yugoslavia.

The work of two organizations are of special importance in regulating affairs in the sphere of furniture. These are:

- The ISO Technical Committee for Furniture (TC 136), and
- The Quality Board of the European Furniture Union UEA (Union Européenne de l'Ameublement).

The Technical Committee for Furniture (ISO/TC 136) has, in the past three years, been most active in considering testing methods and in the categorization of furniture by usability groups. The Quality Board of the UEA, which began work in 1978, has set itself the task of establishing a collective international trade-mark for furniture, and is pesently preparing a specification of quality demands (catalogue) which will contain iternational conditions on quality levels.

When the results of these two organizations are published, they will, in many ways, serve as a primary orientation for the elaboration of the concept and principles of the Yugoslav system of quality assessment. International standards should be the basic rule in adopting our own catalogue, especially in the direction of quality demands and testing methods, so as to ensure the highest possible degree of unification and the optimum inclusion into the international market.

Marking differentiation of individual properties

Apart from the need for marking products with the quality label which expresses the overall properties of quality, recent years have also seen an increasing need for the marking of particular, specially characteristic, individual properties of products (product groups).

First of all, there are the characteristics which should ensure safety of use. Some countries have thus not only legally prescribed safety for given types of furniture, but have also prescribed compulsory marking, for example:

- in the Federal Republic of Germany, since 1981, all bunk-beds mut be marked GS (Geprüfte Sicherheit - safety tested); the product must be constructed so as to prevent injuries from falling off it or hitting it.

- In the United Kingdom, since 1981, all upholstered furniture that has not passed testing with a burning cigarette must be marked with a triangular label warning of the danger of its inflammability.

Furthermore, there are the efforts of associations and groups of producers to protect particular outstanding and well known quality characteristics, and to submit themselves voluntarily to regulations. Various markings with collective trademark are known, as for example:

- "Exclusive European Furniture", established by the International Organization for the marketing of Exclusive Furniture, to denote the high precision of making and purity of the style represented.

- "Touch wood" registered by the Timber Research and Development Association in the United Kingdom to distinguish products of real (touchable) wood from imitations.

- "Protected wood" denotes that the chemical substances applied to protect against biotic wood pests and fire are regularly tested; the mark was established by the Association for the Supervision of Wood Protection and Fire Resistance in the Federal Republic of Germany.

YUGOSLAVIA

We do not yet have a system which would enable the acquisition of rights to a collective mark, or a quality mark issued for the whole of Yugoslavia. However, legal grounds exist for such a system to be established on two possible bases, namely:

1. Allocation of rights for a JUS Quality Mark.
2. Allocation of rights for a Quality Mark as a collective trade-mark.

The first option relates to the Act of standardization (Official Gazette of the Federal authorities No. 38/77), with the general propositions laid out in Chapter VIII and the Federal Institute for Standardization put in charge.

The second option relates to the Act on the protection of inventions, technical improvements and differentiation marks (Official Gazette of the Federal authority No. 34/81), which legally regulates trademarks protected by law.

Quality levels of production can be divided into basic and special qualities. Basic quality demands for a given product are inluded in basic standards and regulations, obliging the producer to verification by testing conformity before submitting his production to sale. Special quality demands, concerning levels above the basic, are also subject tp standardization; assessing quality is here connected with periodical testing and supervision, so as to assure the permanency of the level of quality attained. For business and other reasons the producer may independently decide whether or not to join the system of special quality.

The Institute for Standardization is in charge of the quality mark: it is responsible for the proper functioning of the system. It will, for each particular product (or related group), name a commission for the assessment and control of conformity, and an authorized testing organization; finally it is its duty, at the right moment, to issue the mark with an entry into the Register according to the procedure described hereunder.

The procedure begins with the application of the producer, in which he gives the type of product, names a representative, agrees to the obligation of testing during production, and permits the supervision and control by the commission and testing organization. The Institute's commission for the assessment and control of conformity has the job of assessing production conditions and qualifications of the factory control; a report, in the form of Control Sheet No. 1, is compiled. If the conditions are fulfilled, the commission then carries out continued supervision of the work of the factory control and of conformity of production to regulations, the results of which are tabulated in Control sheet No. 2. The authorized testing organization carries out an attestation of the product type, a control test of a product from actual production and a product from the market at least once a year, the results are entered into Control sheets Nos. 3, 4 and 5. The director of the Institute for Standardization will, upon obtention of the attesting documentation, then issue a permit for the use of the mark. Apart from the Institute, control of the functioning of the system is also carried out by organs of the inspection agency, who watch over the correct execution of the prescribed conditions by the producer's distribution and salesmen, that is by all those by whom the quality mark is used.

The short description of the procedure shows that our system for acquiring the right to use the quality label is storngly concentrated and centralized in the organs of the Yugoslav Institute for Standardization in Belgrade. The experience of some countries where the issuing of quality marks is well developed, has however led to the conclusion that on account of the great extent of work, on account of the many stipulations to be consulted, and of the numerous contacts required with the producers, the centralized system could not operate efficiently. A quick glance will show that the woodworking industries would need to have five to six control commisisons permanently busy on the job at the Institute.

The multitude of commissions employed by a single organ (commission for establishing standards and attestation commissions already exist) can do no more than hamper quick and efficient work. Incentives for good work are also bound to be small, if they are not to be stimulated by the producers endeavouring to attain higher levels of quality. Business and other special interests will form much better within professional quality associations which could be established with the chambers of commerce or business associations. As the process of the fulfillment of conditions for the acquisition of the quality mark is very broad and wanting (compilation of special standards), and therefore very protracted in time, the procedure could be shortened and work better organized through the conclusion of a special agreement, or even through a self-management agreement for the promotion of levels of quality in the woodworking industries. Commissions authorized by the institute would be stipulated in the agreement, which would include interested parties grouped by individual product groups of the woodworking industries. Apart from this, the quality association would be charged with the promotion of the label among consumers, and with instruction of the public on the correct understanding of the quality properties of products, mostly in the form of handy pamphlets.

Literature cited

Logar A., Mihevc S., Prevc E.: "Zahteve o visji kvaliteti pohistva za pridobivanje kvalitetnega znaka" (Criteria for a high quality furniture), Ljubljana, 1982.

Mihevc S.: "Minimalni uslovi kvaliteta namjestaja" (Minimum quality requirements for furniture), Ljubljana, 1974.

Izbor predpisov o kvaliteti pohistva: (Selection of regulations of quality for furniture):

- ISO TC/136 (International Organization for Standardization)
- NF - Marque Nationale de Qualité de l'Ameublement
- Möbelfakta
- JUS (Standards of Yugoslavia).

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United Nations Industrial Development Organization

Distr.
LIMITED
ID/WG.390/14/Add.1
11 May 1983
ENGLISH

Workshop on Technical Appraisal of Public
Sector Mechanical Wood Processing Industries
Ljubljana, Yugoslavia, 11 - 23 April 1983

QUALITY CONTROL OF FURNITURE [1/]

Addendum

Diagramatic description of the testing procedures for quality control of furniture

by

Slavko Mihevc [2/]

1/ The views expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. This document was reproduced without formal editing.

2/ Professor, Department of Woodworking, University of Ljubljana.

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Introduction

The sketches shown in Figures 1 to 16 of this addendum depict, diagramatically, the standard procedures for the testing of furniture. The procedures are those prescribed in the Yugoslav standards, but they are similar to a larger or lesser extent with those prescribed in the furniture standards of many other developed countries.

The number of cycles, their speed of application, etc. vary according to the envisaged end-use of the product - they are higher for contract furniture than for domestic use, and the defections permitted are correspondingly lower. It is beyond the scope of this short paper to go into the details for the various quality levels for each and every test described; the sketches are intended to give the layman an indication of the procedures.

Those shown in figures 17 to 38 are intended to give an indication of the loading specifications of the standards for various products.

Figures 39 and 40 show diagramatically, tests to measure the quality of surfaces.

TESTS FOR SINGLE SEAT UNITS
(CHAIRS AND ARMCHAIRS)

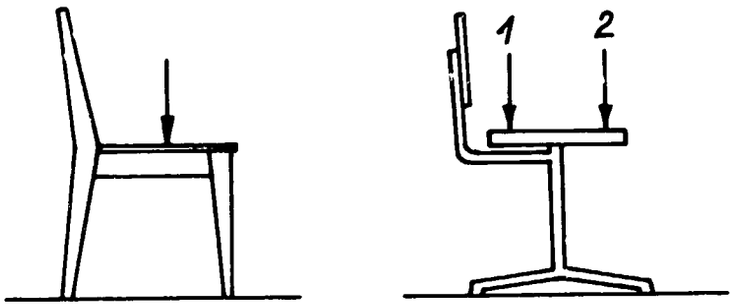


Figure 1: Test of the static loading of a chair

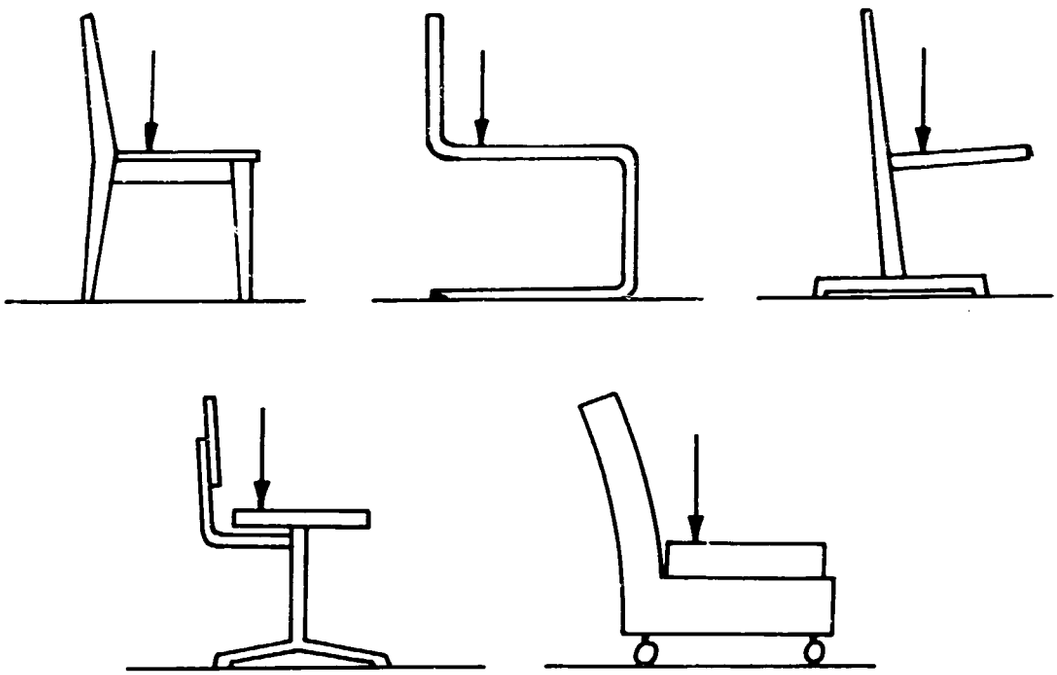


Figure 2: Fatigue test of the seat

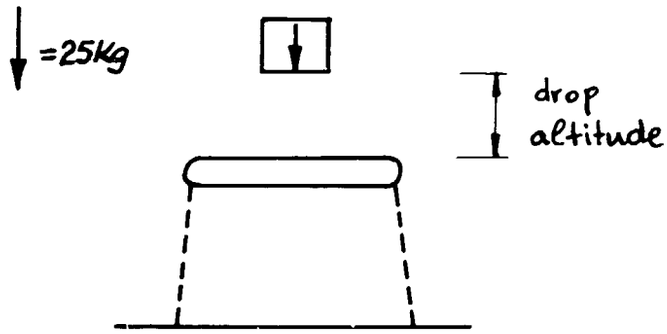


Figure 3: Impact test of the seat

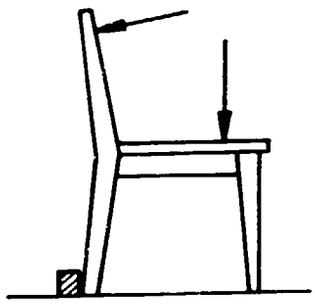


Figure 4: Test of the static loading of the back.

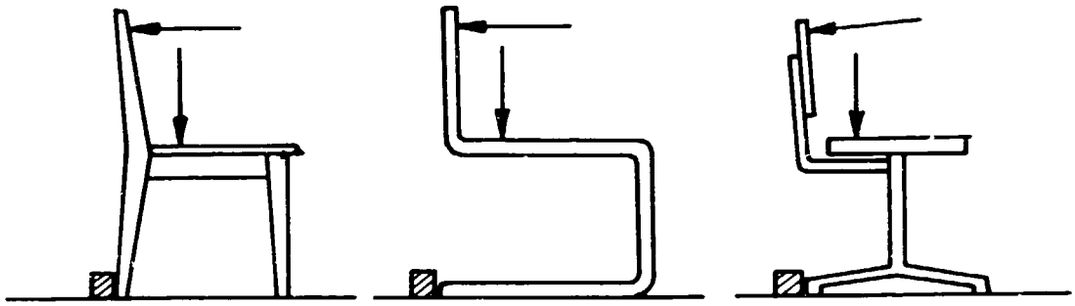


Figure 5: Fatigue test of the back (this test reproduces movements by the user of the chair).

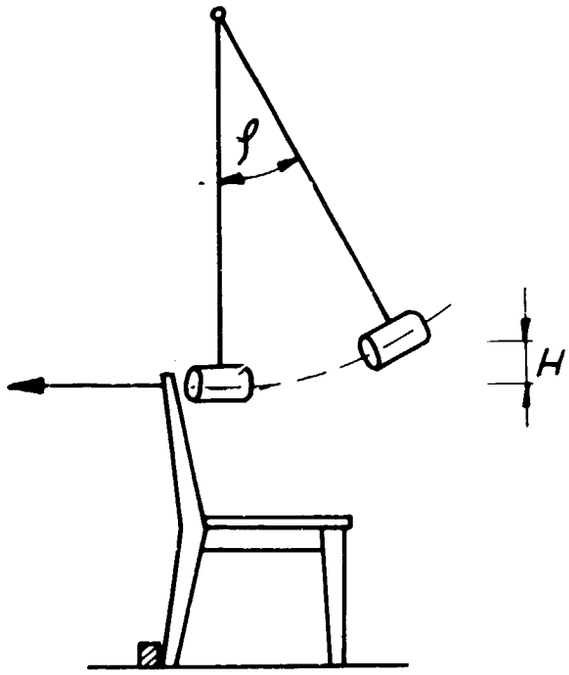


Figure 6: Impact test of the back

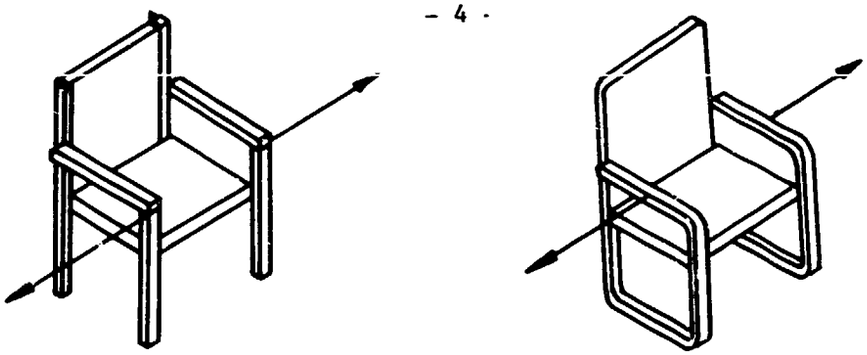


Figure 7: Static lateral loading test of the arm supports.

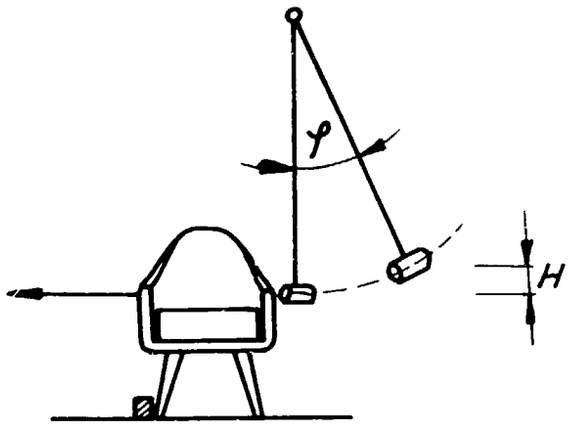


Figure 8: Lateral impact test of the arm support.

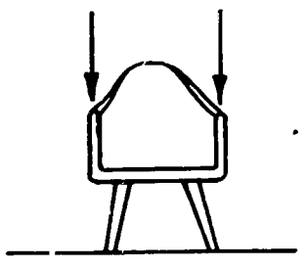
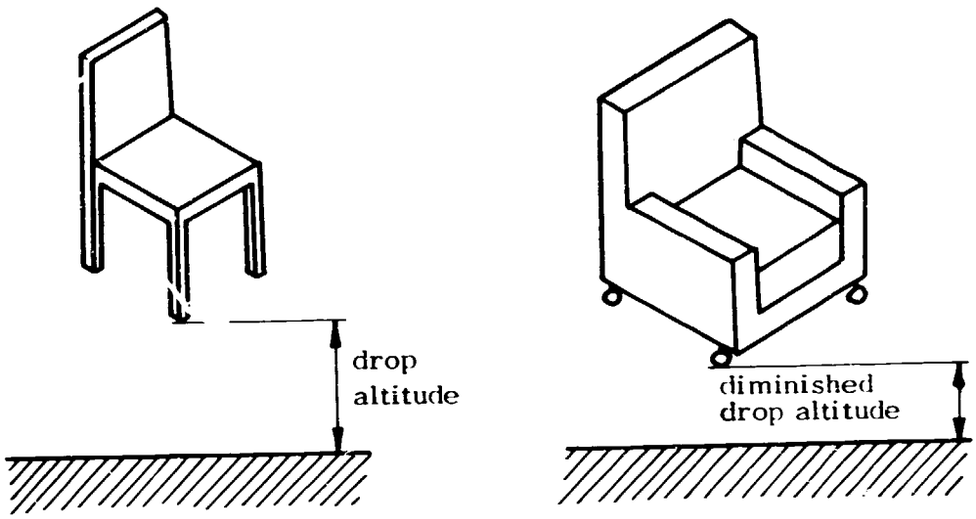


Figure 9: Static loading test of the arm supports in the vertical direction (this test reproduces the forces on the arm supports when the person using the chair stands up).



a) ordinary chairs

b) armchairs and chairs with castors

Figure 10: Drop test for chairs.

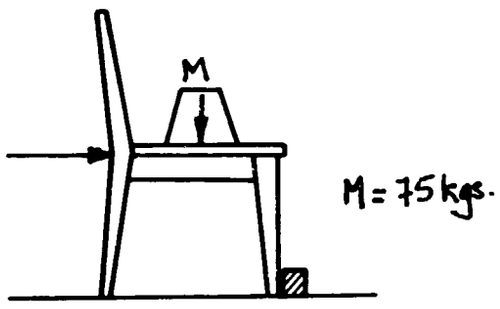


Figure 11: Testing rigidity of front legs in forward direction

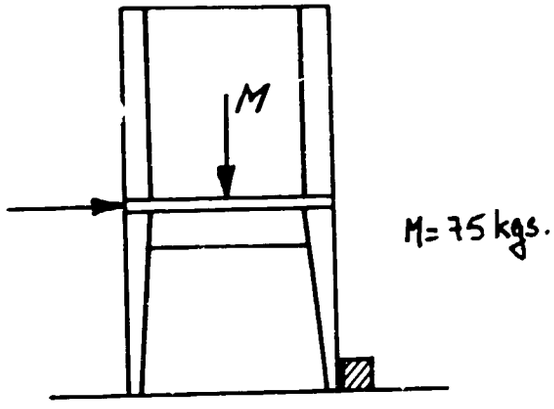


Figure 12: Testing rigidity of front legs laterally

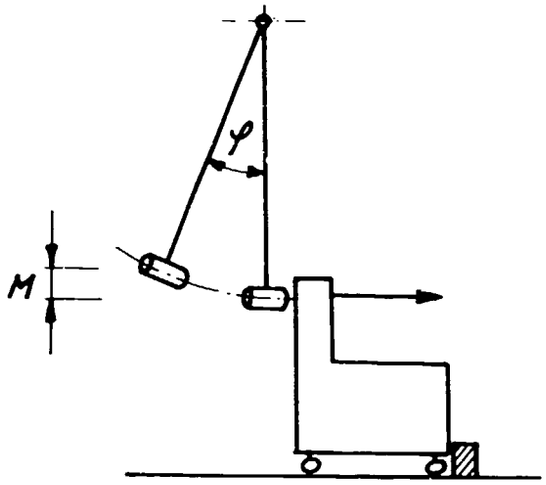


Figure 13: Impact test of the back for armchairs and multi-seat units (sofas)

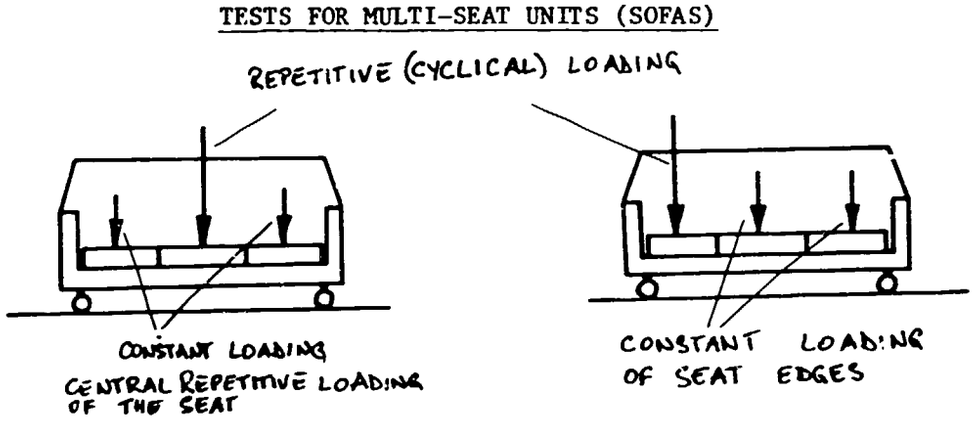


Fig. 14a: Static loading of the seat

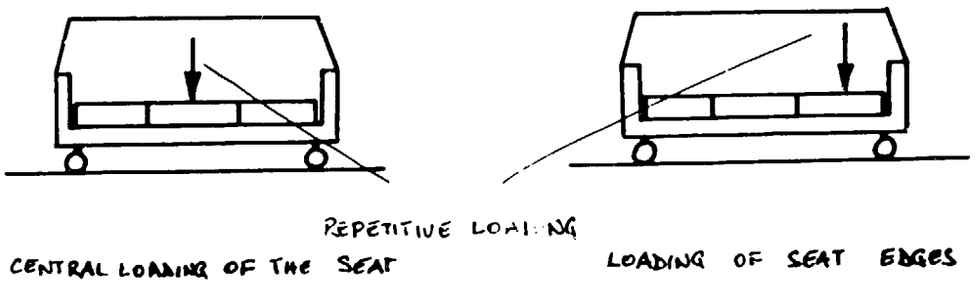


Fig. 14b: Fatigue test of the seat

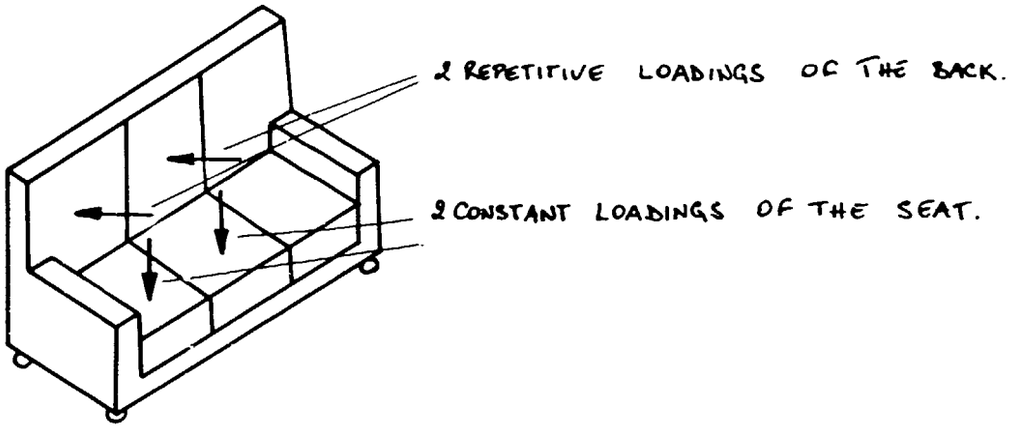


Figure 14c: Static loadings of the back (double loading of the back)

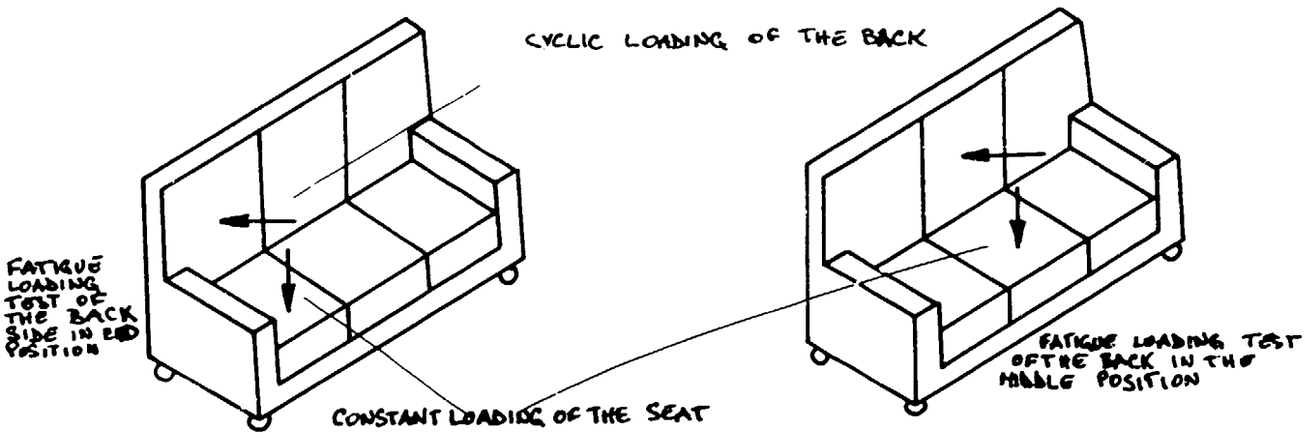


Figure 14d: Fatigue loading test of the back

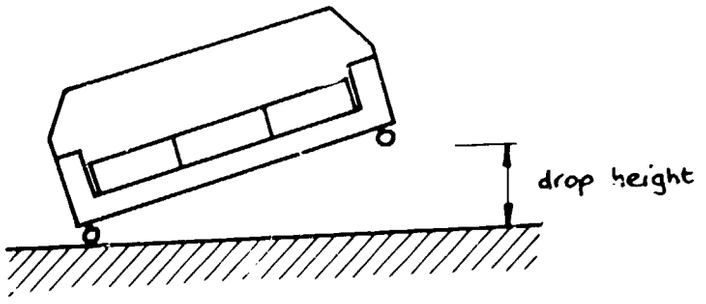


Figure 15: Drop test for multi seat units (sofas)

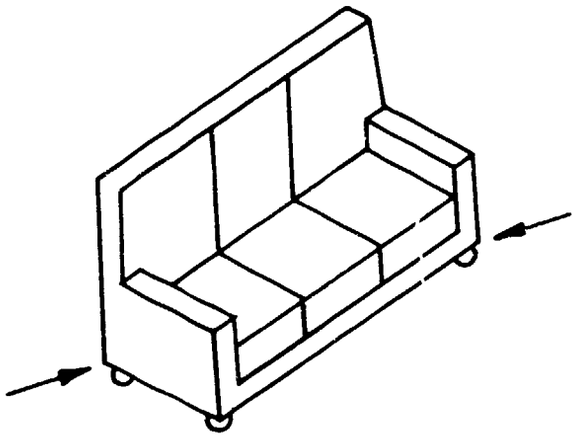


Figure 16: Diagonal loading of the base

LOADING SPECIFICATIONS OF THE STANDARDS

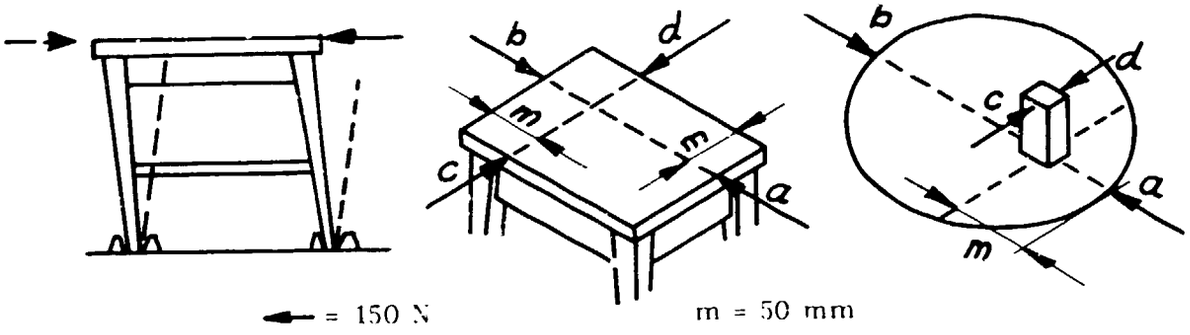


Figure 17: Loading sp cifications for chairs without backs
(Note: Loading is applied in cycles: a, b, c, d, a, b, etc.)

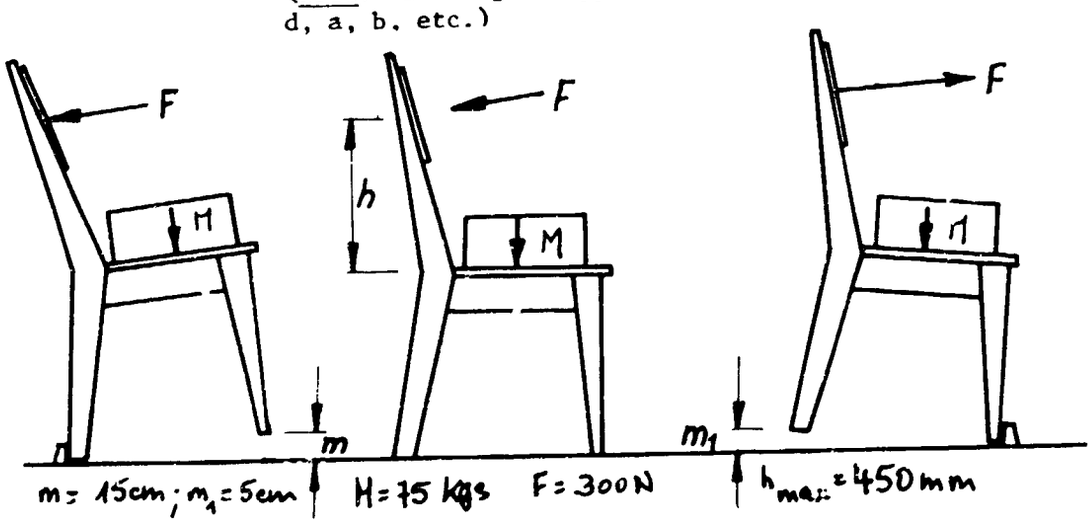


Figure 18: Loading specifications for chairs with backs

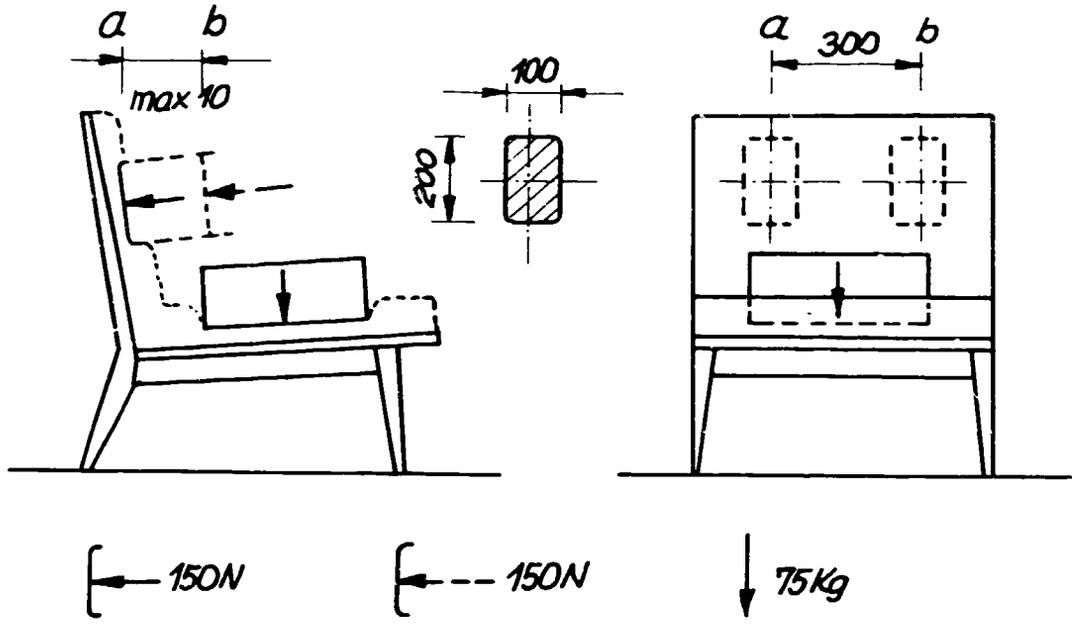


Figure 19: Loading specifications for testing backs of armchairs

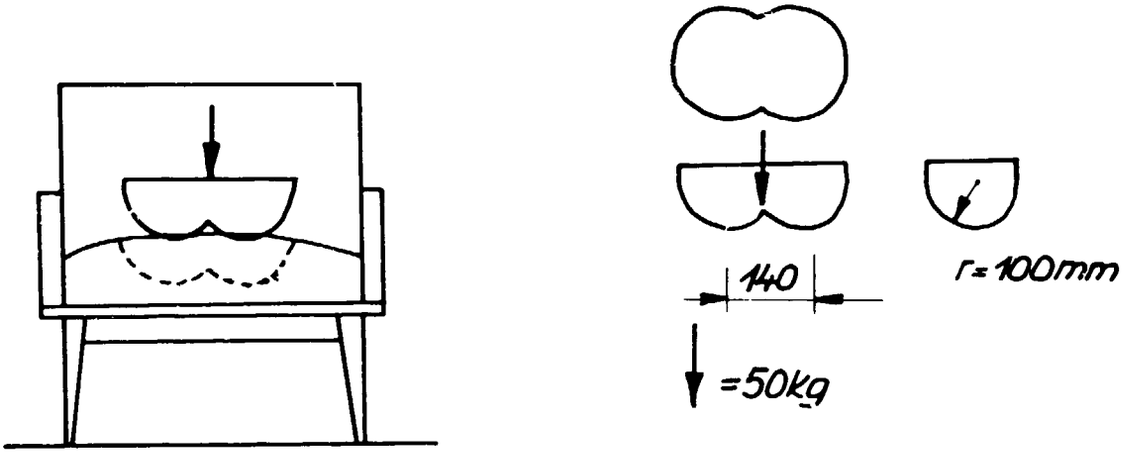


Figure 20: Loading specifications for the fatique test for seats of armchairs

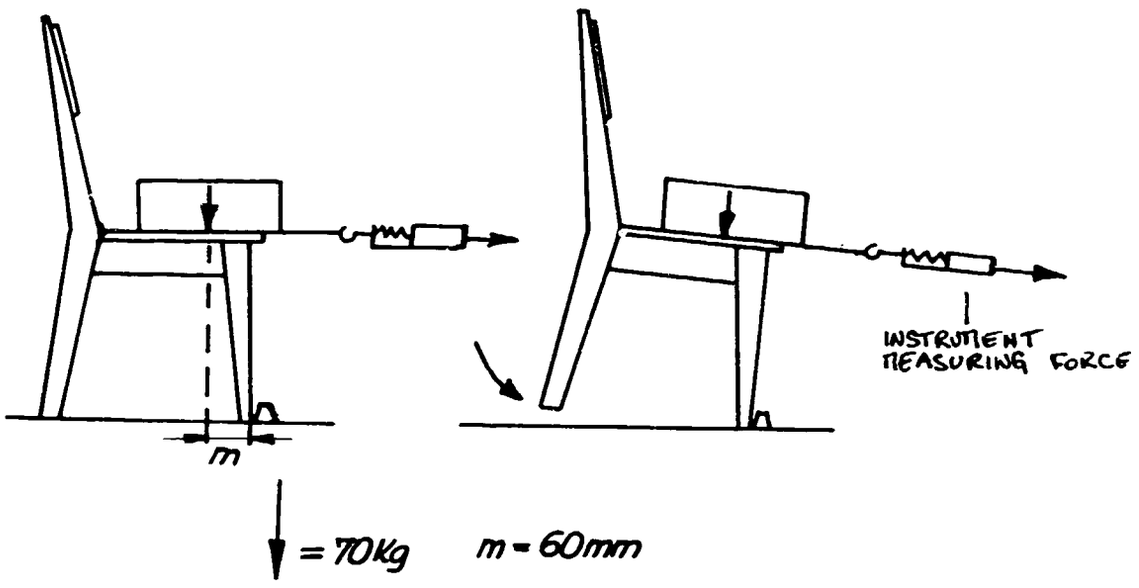


Figure 21: Loading specifications for testing the stability of chairs (lateral loading of seat)
(The force necessary for toppling the chair forward is recorded.)

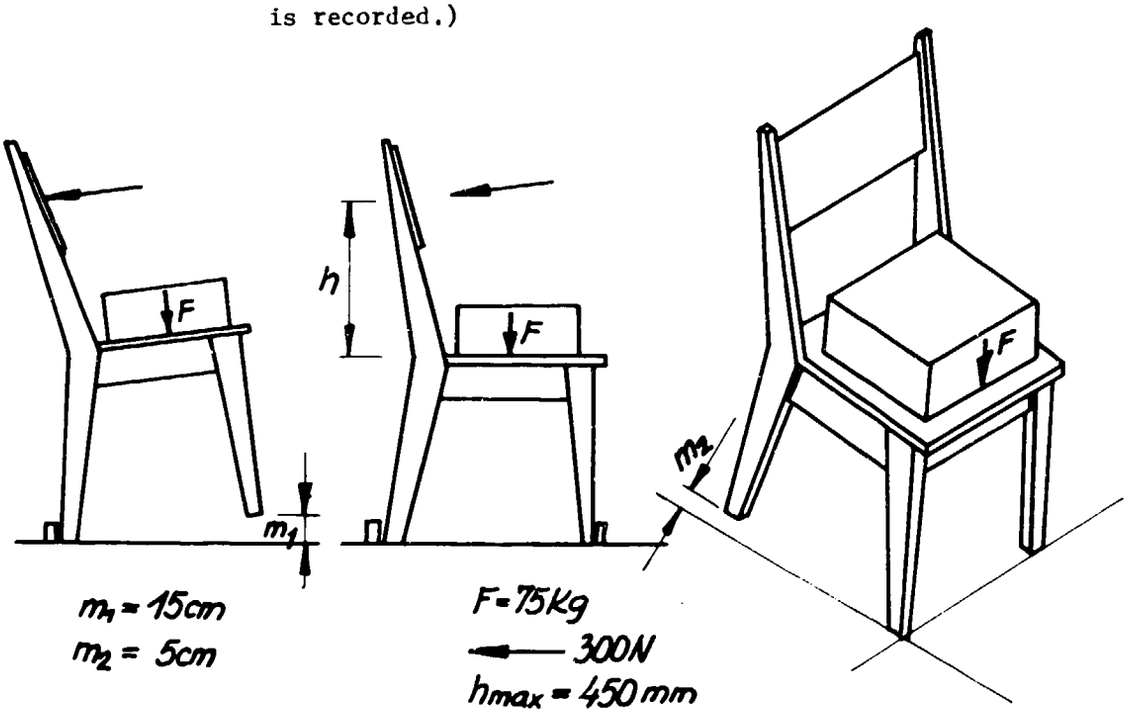


Figure 22: Loading specifications for testing the stability of chairs (loading of backs

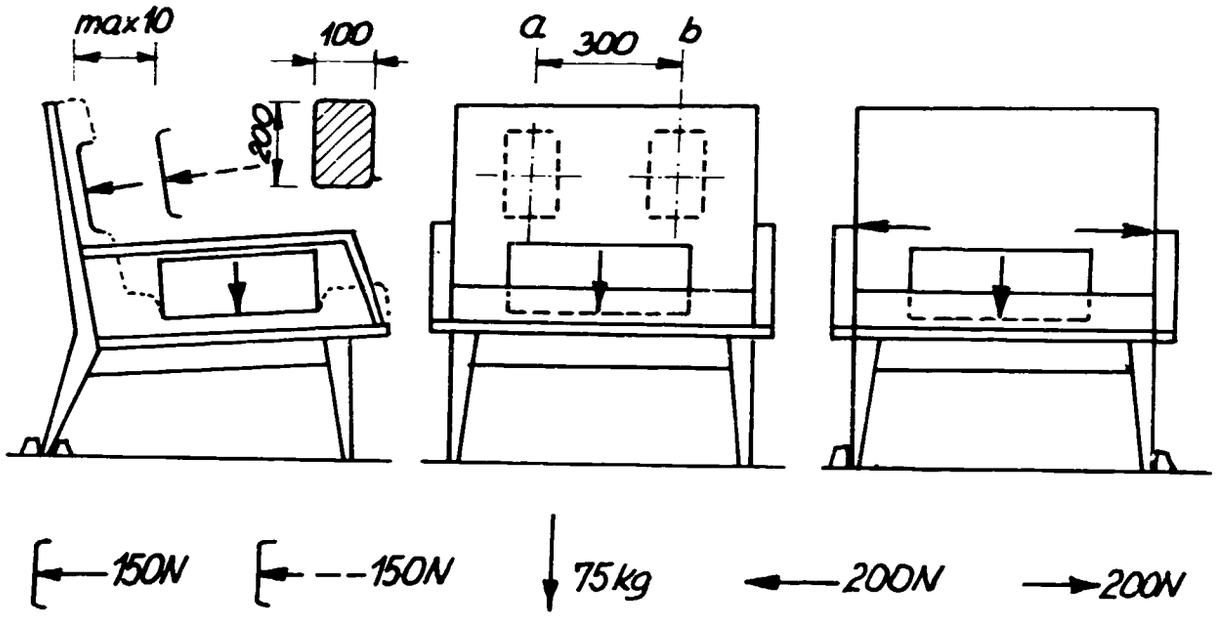


Figure 23: Loading specifications for fatigue tests for backs and arm supports of chairs (Loading of back and arm supports sequential - a and b applied sequentially).

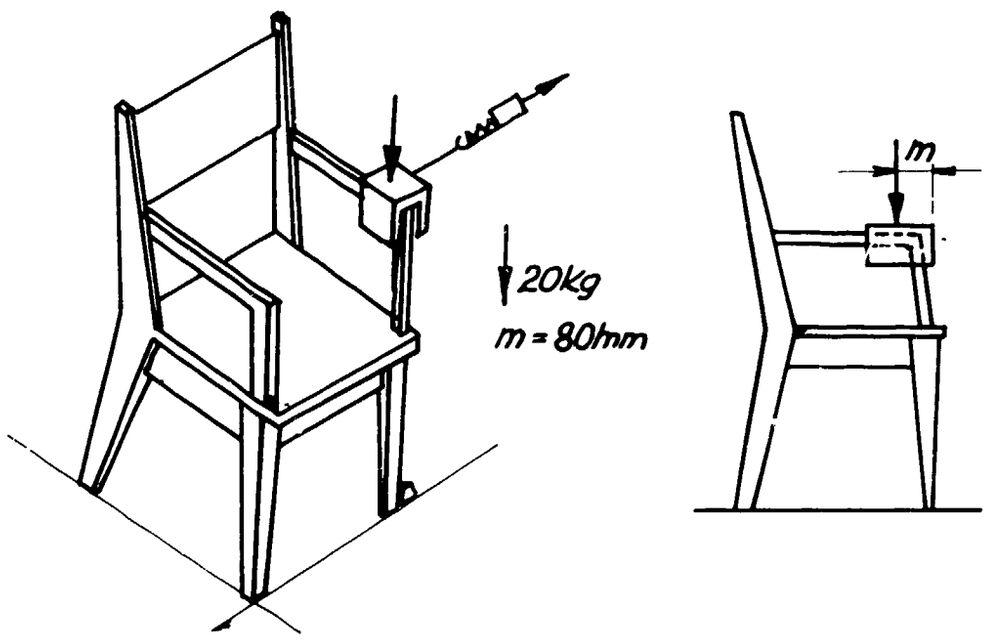


Figure 24: Loading specifications for the stability test for armchairs

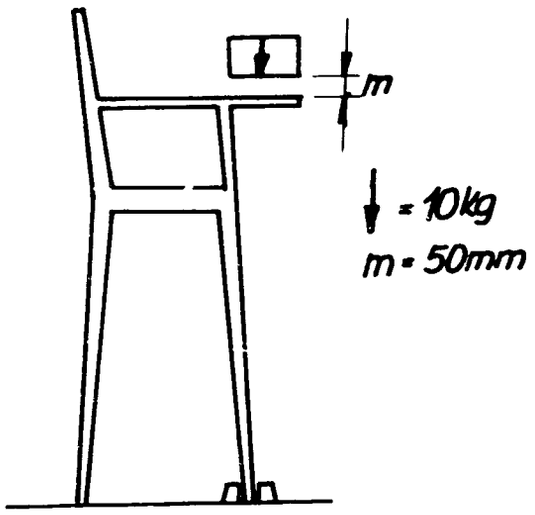


Figure 25: Loading specificationsfor testing the stability for baby chairs (impact test).

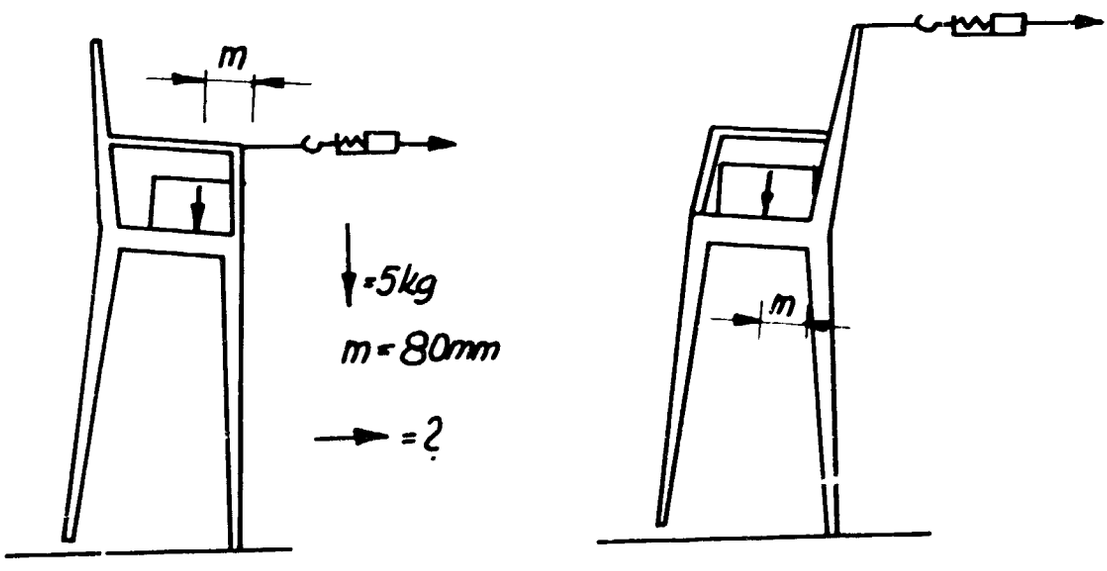


Figure 26: Loading specifications for testing hte stability of baby chairs

BEDDING

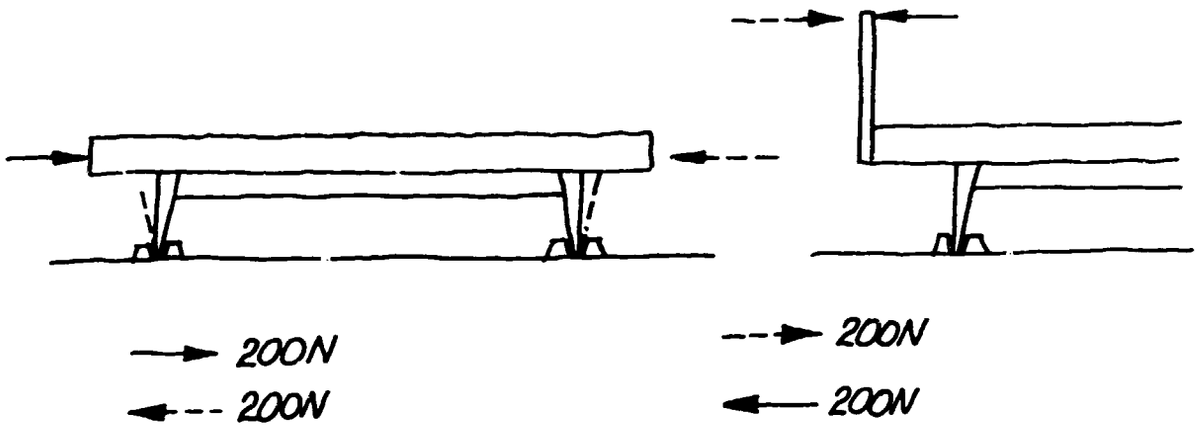


Figure 27: Loading specifications for testing the rigidity of legs and end boards of beds.

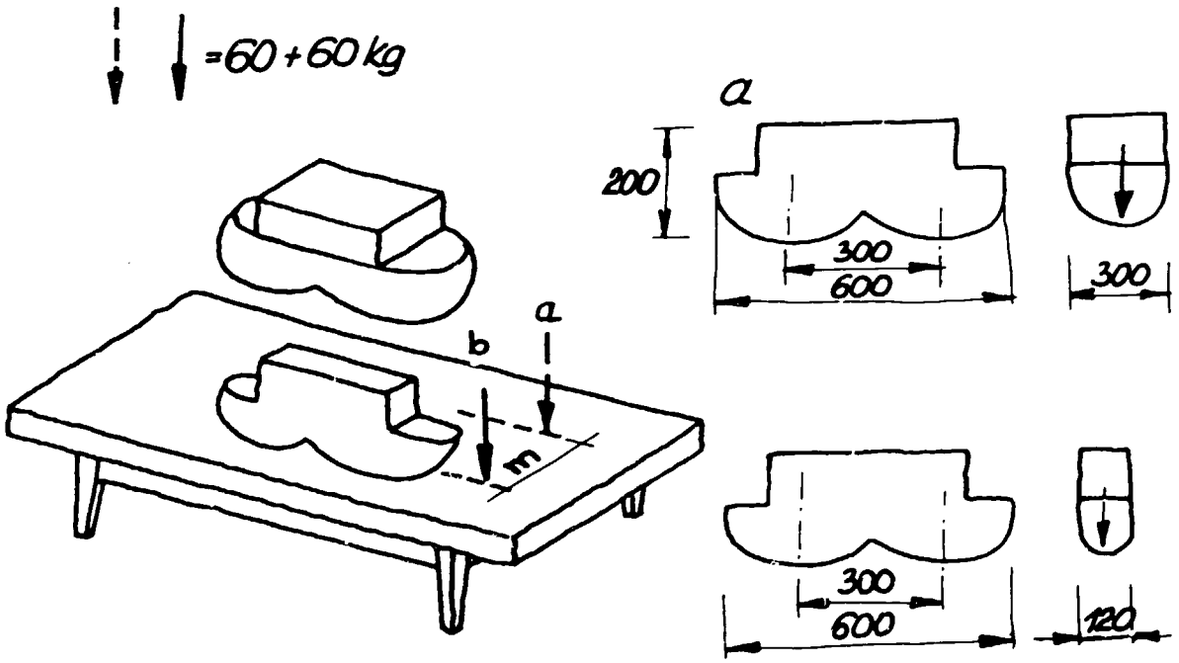


Figure 28: Loading specifications for the fatigue test of beds (loads a and b are applied consequently).

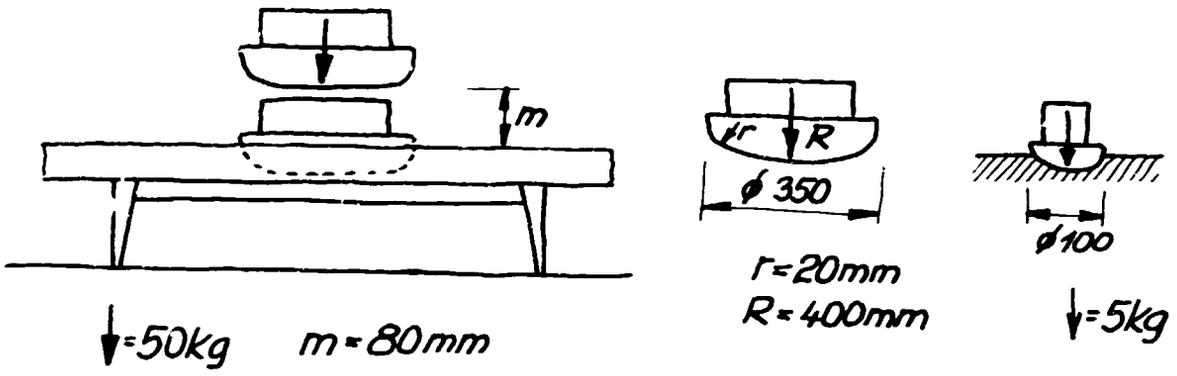


Figure 29: Loading specifications for the impact test of beds

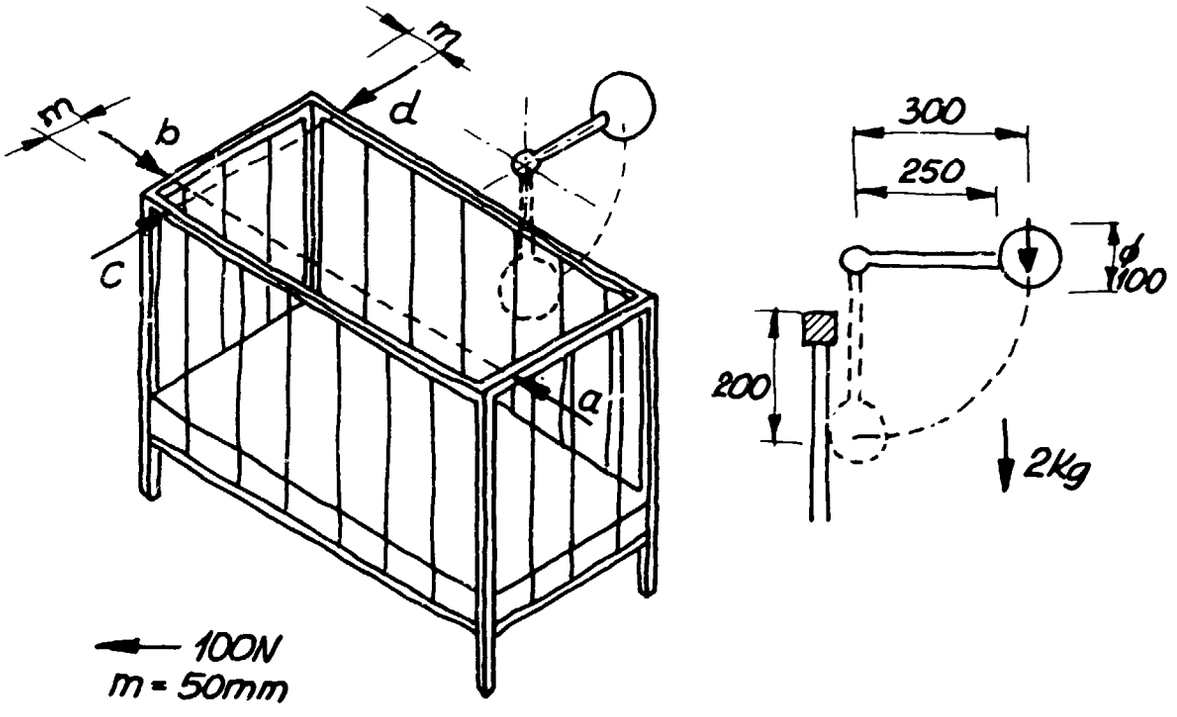


Figure 30: Loading specifications for the (a) impact test for determining the strength of fences of baby beds, and (b) the rigidity test of baby beds (each bar is tested). (Loads are applied a, b, c and d sequentially).

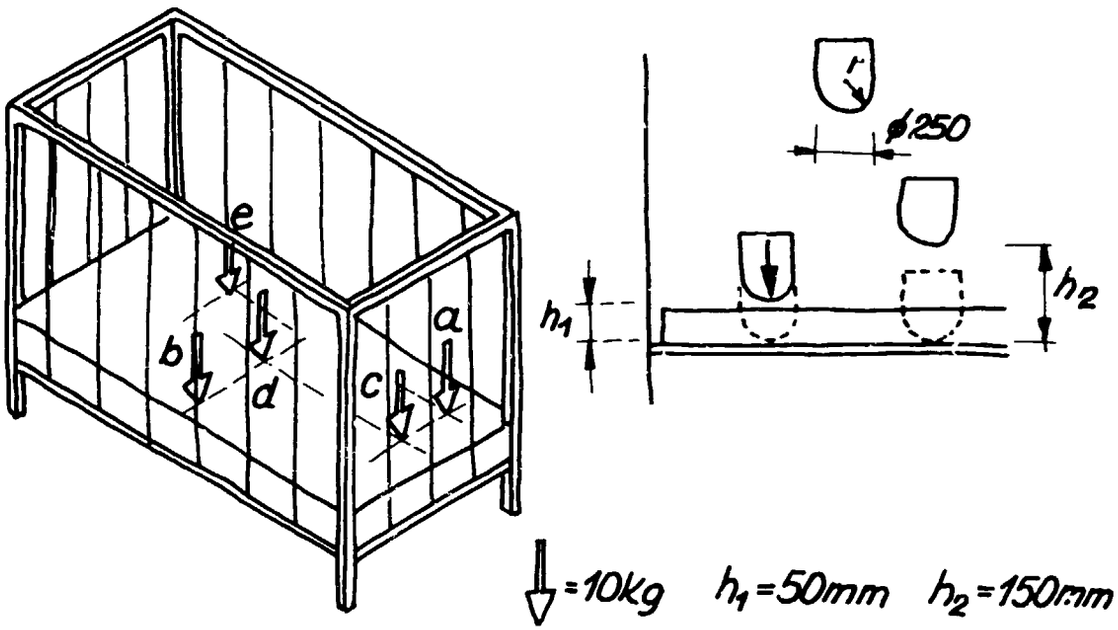


Figure 31: Loading specification sfor the impact test on the base of baby beds (loads are applied at a, b, c and d sequentially).

TABLES AND CHAIRS

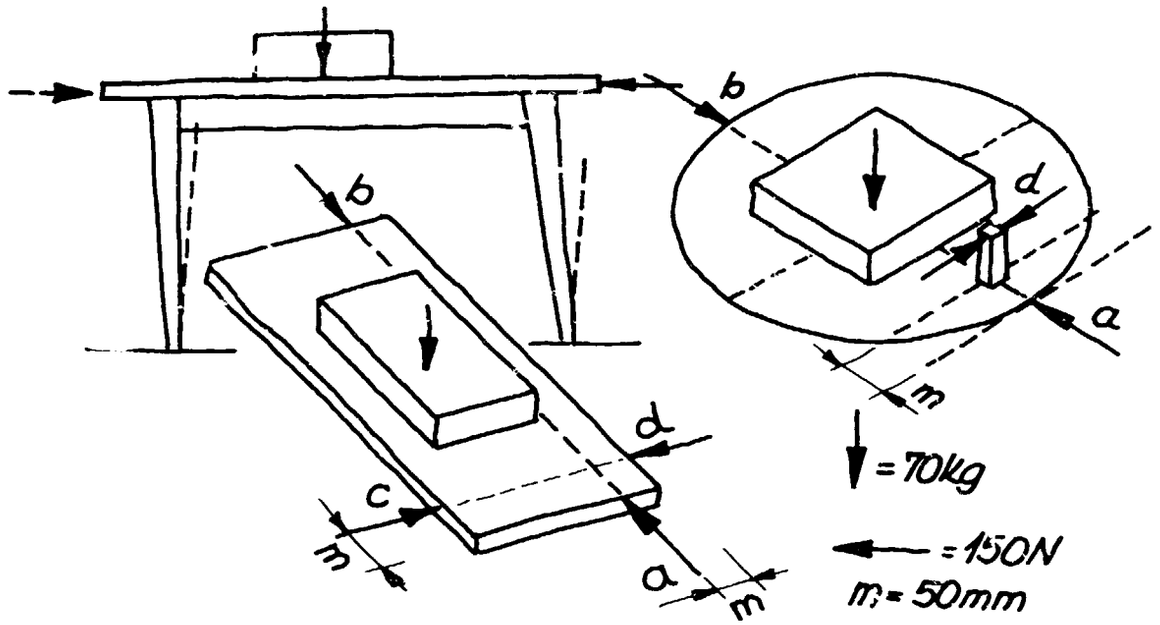


Figure 32: Loading specificationsfor testing the stability of tables and desks to raking forces.

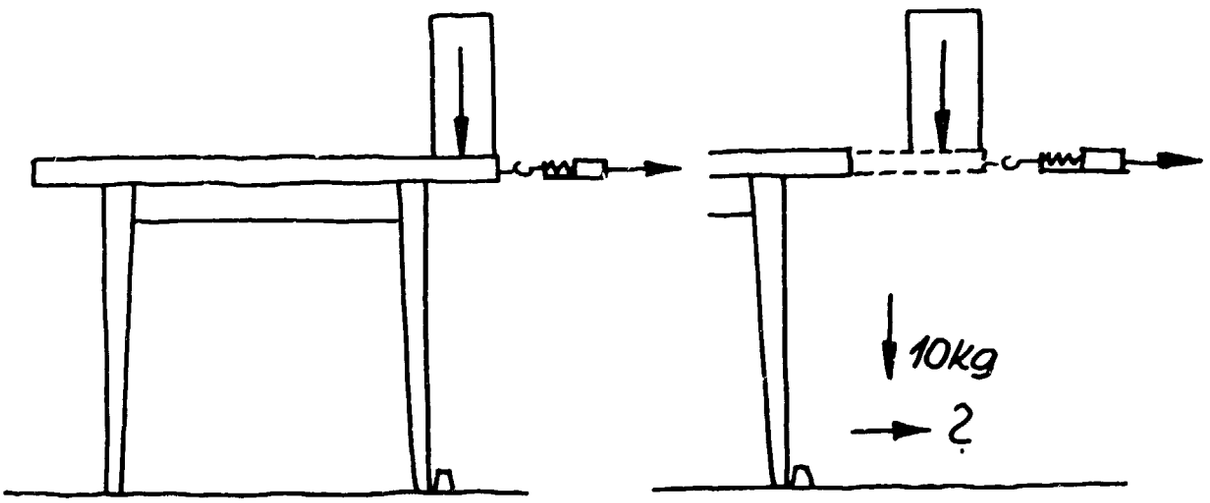


Figure 33; Loading specifications for testing the stability of tables to loading of extremities.

CHESTS OF DRAWERS AND CABINETS

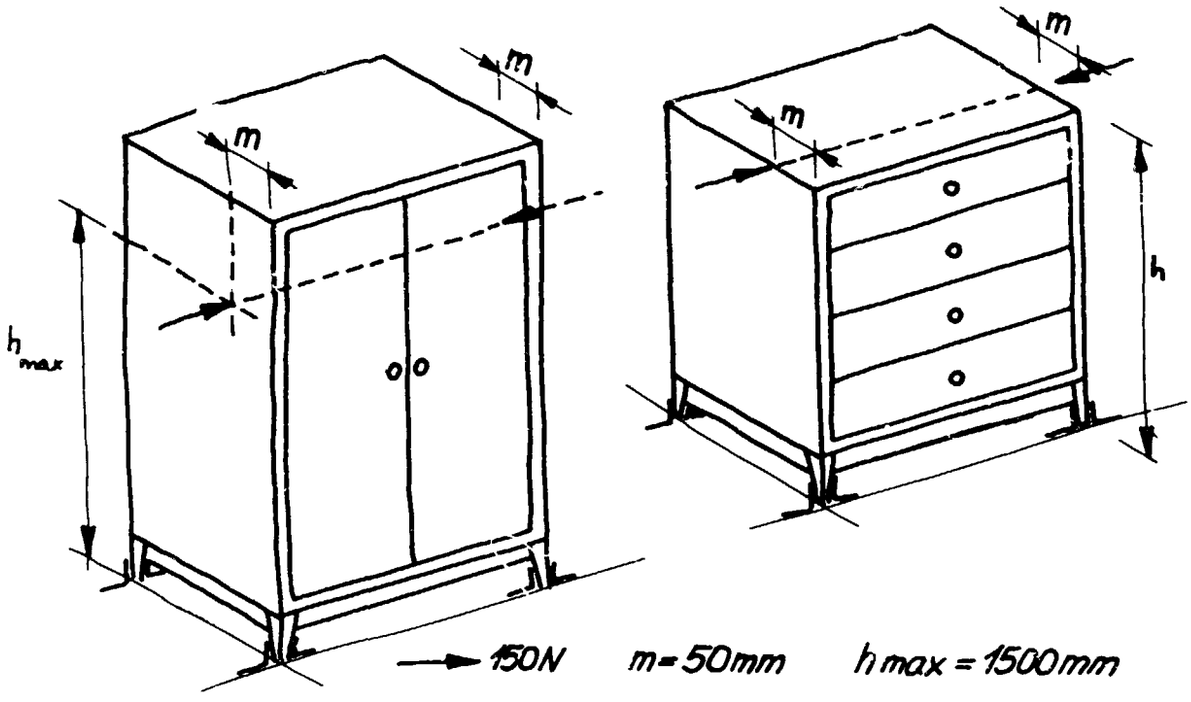


Figure 34: Loading specifications for the rigidity test on chests of drawers and cabinets.

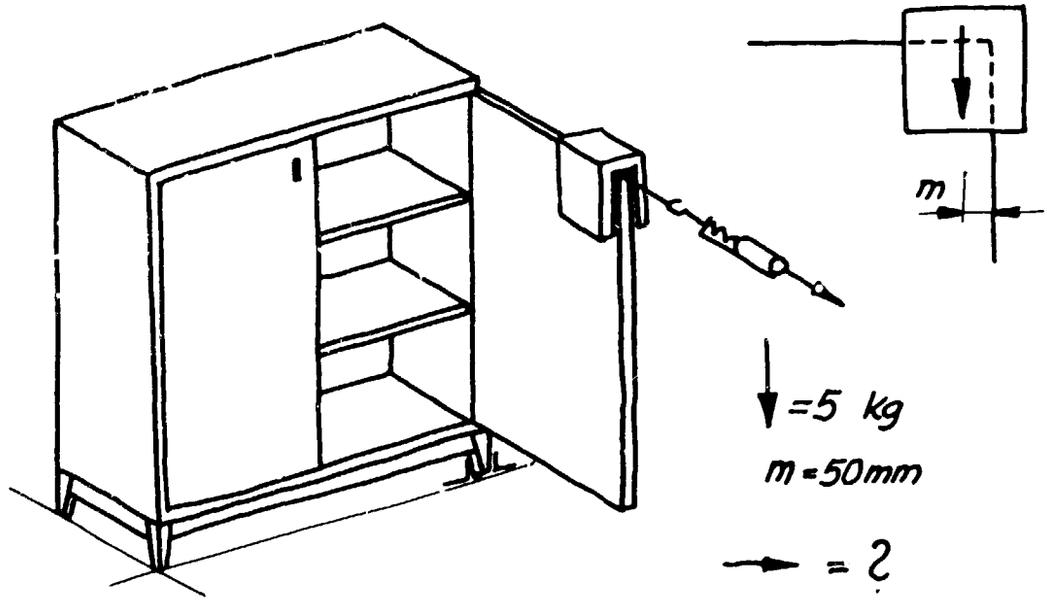


Figure 35: Loading specification sto test the stability of chests of drawers and cabinets

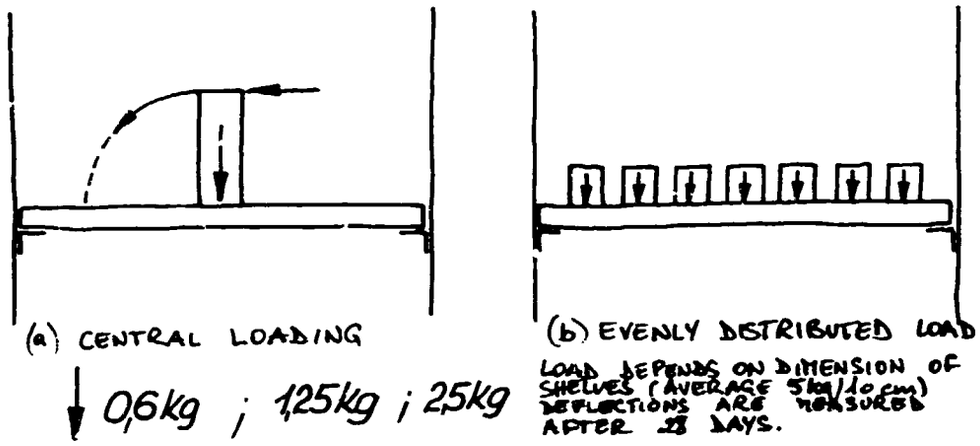


Figure 36: Loading specifications for testing the rigidity of shelves

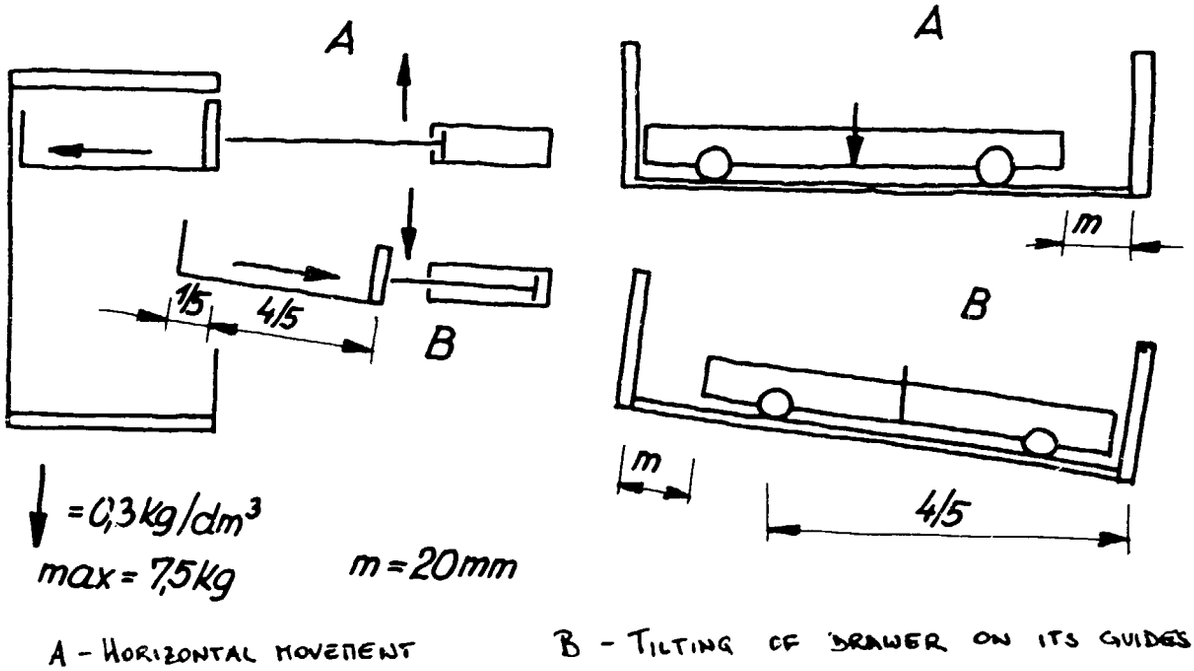


Figure 37: Loading specifications for the testing of drawers (solidity)

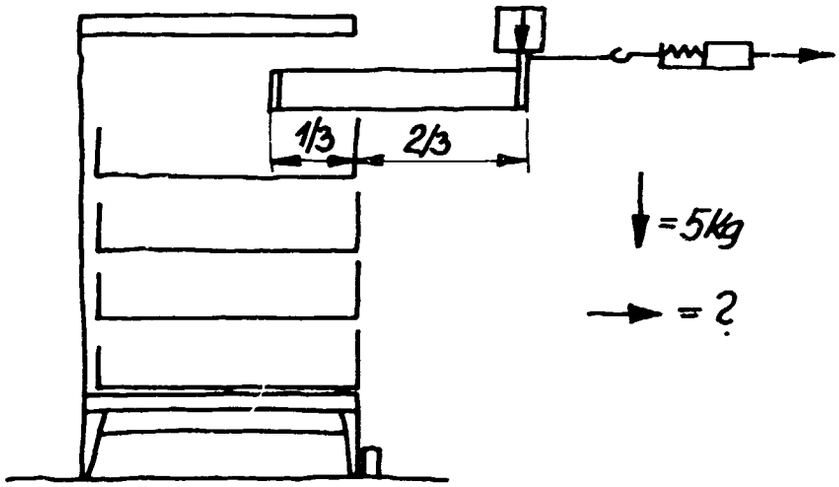


Figure 38: Loading specifications for testing the stability of chests of drawers. (First test: stability if all drawers are pulled out - with no load. Second test: if stable, 5 kgs load is applied.)

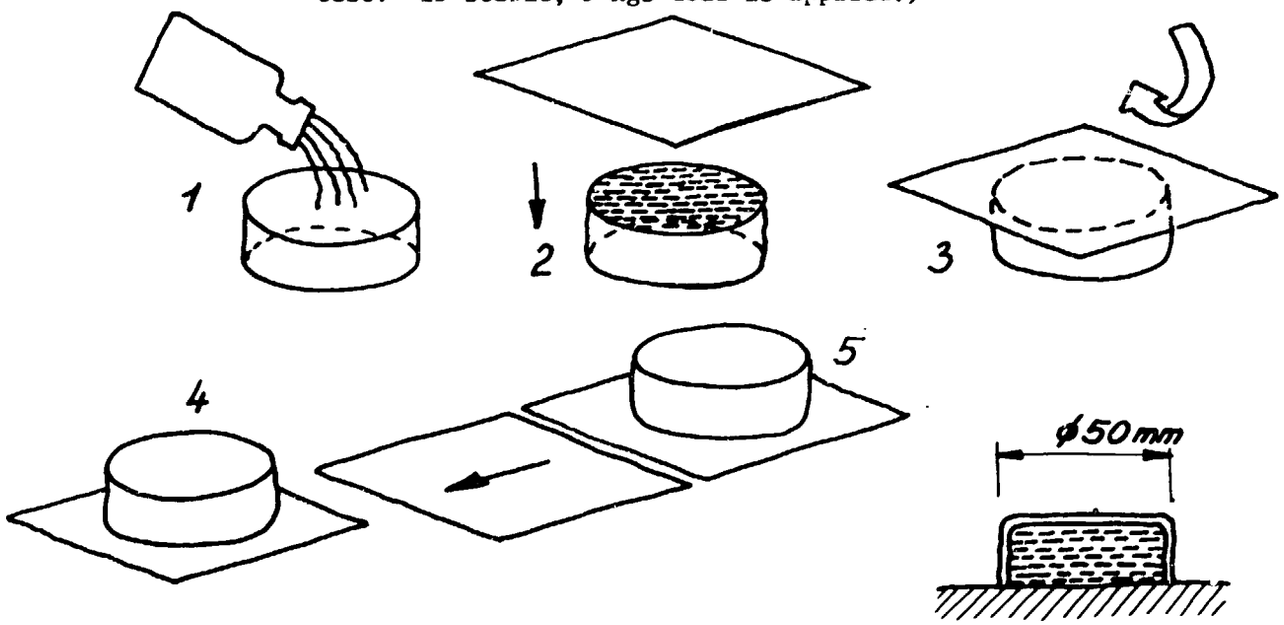


Figure 39: Test of effect of liquids on surfaces
Legend: 1. Pour the liquid prescribed in the test in a cylindrical glass recipient with a diameter of 50 mm. 2. Place a foil on it. 3. Turn upside down so that foil is on bottom. 4. Place both on surface to be tested. 5. Slide the foil from under the glass recipient. (The liquid is now in contact with the surface to be tested.

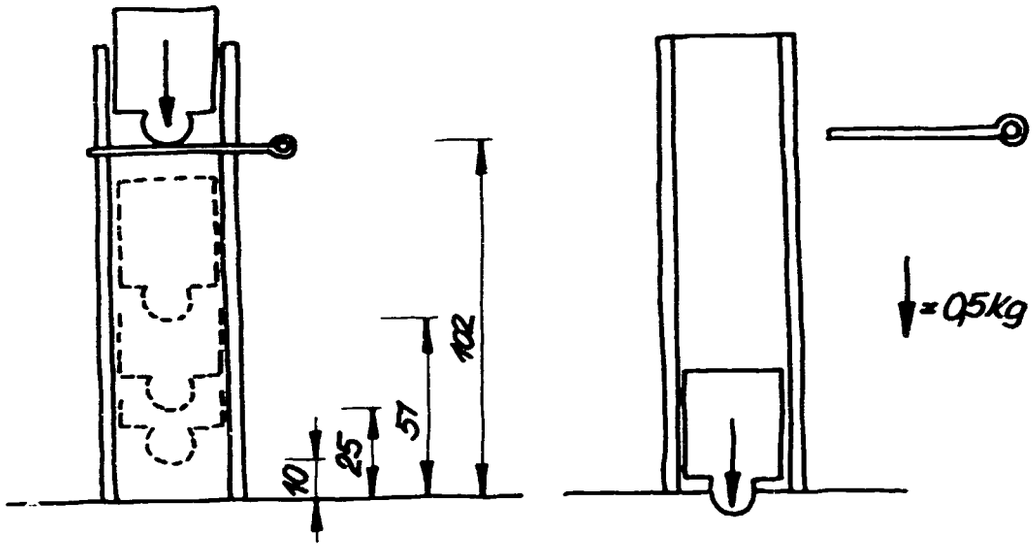


Figure 40: Equipment for measuring resistance of surface to impacts. (A 0.5 kg load is dropped from heights increasing from 10 to 102 mm.)

Literature:

Logar A., Mihevc S., Prevc E.:
"Zahteve o višji kvaliteti pohištva za pridobivanje kvalitetnega znaka"
(Criteria for a high Quality furniture), Ljubljana 1982

Mihevc S.: "Minimalni uslovi kvaliteta namještaja", Ljubljana 1974
(Minimum quality requirements for furniture)

Izbor predpisov o kvaliteti pohištva:
(Selection of regulations of quality for fumiture)

- ISO TC/136 (International Organization for Standardization)
- NF - Marque Nationale de Qualité de l 'Ameublement
- Möbelfakta
- JUS (Standards of Yugoslavia)