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UPHOLSTERED FURNITURE INDUSTRY

DP/HUN/74/007

HUNGARY

TERMINAL REPORT

Prepared for the Government of Hungary by the
United Nations Industrial Development Organization,
executing agency for the
United Nations Development Programme

United Nations Industrial Development Organization

ID. 76-4654

United Nations Development Programme

UPHOLSTERED FURNITURE INDUSTRY

IS/HUN/74/007

HUNGARY

Project findings and recommendations

Prepared for the Government of Hungary
by the United Nations Industrial Development Organisation,
executing agency for the United Nations Development Programme

Based on the work of Desmond P. Cody, industrial engineer

United Nations Industrial Development Organisation
Vienna, 1976

Explanatory notes

References to dollars ($) are to United States dollars.

The monetary unit in Hungary is the forint (Ft). During the period covered by the report, the value of the forint in relation to the United States dollar was $ 1 = Ft 20.54.

A full stop (.) is used to indicate decimals.

A comma (,) is used to distinguish thousands and millions.

Besides the common abbreviations, symbols and terms, the following have been used in this report:

SZKIV	Szék- és Kárpitosipari Vállalat
N	Newton (unit of force) = 10^5 dyne

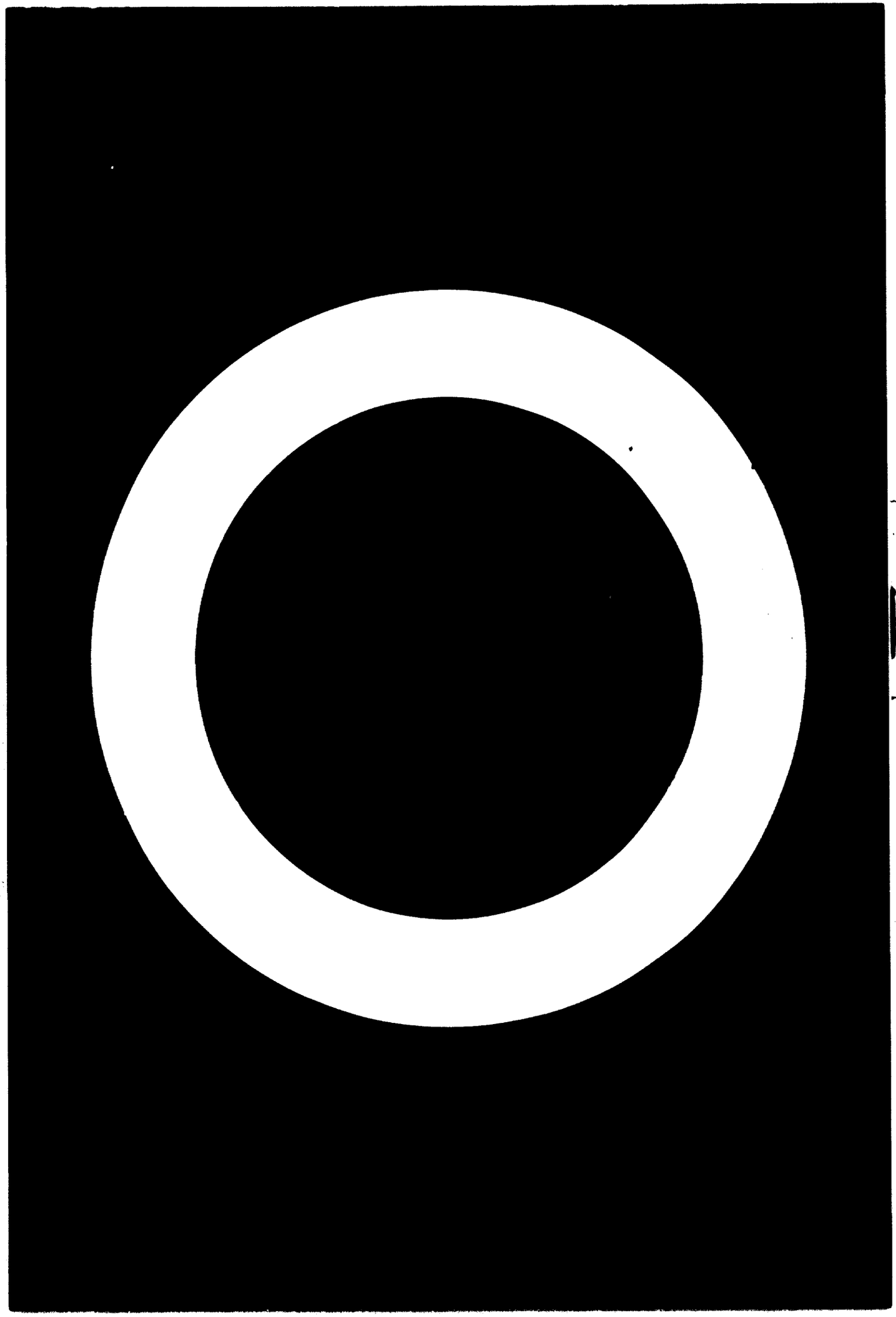
ABSTRACT

At the request of the Government of Hungary to the United Nations Development Programme (UNDP), an expert in the production of upholstered furniture was sent on a two-month mission to advise management of the Szék- és Kárpitosipari Vállalat factory in Budapest and its subsidiaries in Kecskemét and Mohács on improving design and production technology, rationalizing production methods and introducing new materials for use in upholstered furniture. The project, "Upholstered Furniture Industry" (IS/HUN/74/007), began on 4 May 1976 and ended on 3 July 1976. The United Nations Industrial Development Organization (UNIDO) was the executing agency. The government agency co-ordinating the project was the Ministry of Light Industry.

The chief objective of the mission was to identify the major shortcomings of the Hungarian upholstery industry and suggest how they could be rectified. The shortcomings may be summarized as follows:

Poor standard of design and the absence of a realistic product policy
Lack of variety in models produced
Limited range of raw materials
Outdated methods of production
Lack of up-to-date machinery and equipment for upholstery
Rigid standard specifications and quality control procedures
Lack of good marketing policy for both domestic and export markets
Lack of furniture designers
Lack of trained upholstery technicians
Lack of export consciousness on the part of manufacturers

Each of these aspects is analysed in terms of the industry's needs, with emphasis on the need to export to both Eastern and Western European countries.



CONTENTS

Annexes

Figures

Tables

INTRODUCTION

The Hungarian furniture industry is characterized by a small number of very large units, most of which are engaged in the manufacture of case goods, upholstery, bedding and dining-room chairs. It employs 18,100 persons, of whom 9,700 are engaged in the manufacture of upholstery goods, chairs and seating. In 1975, the industry had a turnover valued at 7,981 million forints, of which upholstery, chairs and seating accounted for 34 per cent. Roughly 15 per cent is exported, half of which goes to the other countries with centrally planned economies and the remainder, largely comprising dining-room chairs and some cabinet furniture, to Western Europe.

During the five-year plan for economic development that ended in 1975, the case goods and frame-making sectors of the industry underwent a major re-organization and development programme. There was considerable investment in building, machinery and equipment, so that this sector now enjoys a level of competence equivalent to that found anywhere else in Europe. The upholstery sector of the industry benefited mainly from the provision of better buildings and some additional equipment. The current five-year plan envisages further investment in mechanized equipment for upholstering, so that the industry may increase productivity and improve the quality of its products to the level where it may successfully penetrate the major European markets, as well as satisfy home demand. Annex I gives some data on the industry.

The Hungarian Government formally requested the United Nations Development Programme (UNDP) in September 1974 to provide an expert in modern upholstery methods and techniques to advise and assist one of the largest upholstery concerns in Hungary, Szék- és Kárpitosipari Vállalat (SZKIV), located in Budapest, and its subsidiaries in Kecskemét and Mohács. The project, "Upholstered Furniture Industry" (IS/HUN/74/007), began on 4 May 1976 and ended on 3 July 1976. The United Nations Industrial Development Organization (UNIDO) was the executing agency. The government agency co-ordinating the project was the Ministry of Light Industry. The expert's job description is given in annex II.

During a preliminary discussion with officials of the Ministry of Light Industry and representatives of SZKIV, it was agreed to widen the scope of the project so that other upholstery concerns in Hungary might benefit from its findings.

Accordingly, several visits were paid to other factories, which confirmed that these factories could equally well benefit from the assistance and advice

being provided to SZKIV. Other factors that it was agreed should also be taken into consideration during the project included the training of upholstery technicians, training in design, and the role of agencies such as the Hungarian Standards Office, the Furniture Planning Institute and organisations responsible for domestic and export sales.

The Ministry of Light Engineering requested that a special lecture be given towards the end of the assignment for the development of the upholstery industry in Hungary. This lecture was given on 28 June and was attended by 100 partioipants, including furniture designers, managers and technical personnel of upholstery factories and representatives of the State agencies concerned with the organisation and development of the furniture industry. The lecture dealt with topics covered in this report.

The personnel directly concerned with the projeot at the Ministry of Light Industry were Tibor Kara, László Sopp and László Janoso. The organisations, factories and suppliers that co-operated with the expert in his field work are listed in annex III.

I. FINDINGS

General observations

Until quite recently, the upholstery industry was mainly concerned with meeting demand for seating and bedding. Demand far exceeded supply, so that to maintain some sort of reasonable delivery schedule, the industry evolved a highly rationalized and extremely utilitarian range of seating and bedding that it has continued to produce in vast quantities to the present day. The models produced by the various factories scarcely differ in design and the number produced by any one factory has never exceeded 10.

Factors that have influenced the design of these models include what has been described as the extreme conservatism in consumer tastes; the limited range of raw materials available to the industry; the living conditions of the people, most of whom are housed in three- and four-room apartments in high-rise buildings; and the rigid standards imposed by State agencies such as the Hungarian Standards Office and the Quality Control Institute. The furniture sold on the local market must conform to national standards - hence the lack of innovation.

Factories are in the main totally production-oriented and have little or no contact with the consumer. It is not surprising, therefore, that the products are designed with production rather than consumer considerations in mind, and designers appear to be used as little more than draughtsmen. When a concern such as SZKIV succeeds in exporting to Western Europe, as is the case with dining-room chairs, it is because the concern has been provided with a copy of the desired model, which it carefully reproduces. In these circumstances, it is not unreasonable to assume that this kind of market penetration is based on price only.

Gradually the stage is being reached where market saturation is inevitable, and indeed there is evidence from the factories that some stockpiling is already occurring. Thus a reappraisal of the product policy of the whole industry has become necessary, and with it comes the opportunity to evolve: production facilities can be modernised and the end-product designed to reflect more accurately consumer tastes and preferences.

Many of the shortcomings pointed out in this report are already known to the factories, and many of the recommendations it contains have been touched upon previously by those concerned. The main difficulty has been to convince those responsible for making decisions to act. Furthermore, priority in financing has been given to the corpus (also known as case goods) sector to the detriment of the upholstery sector.

In any event, no matter how the upholstery industry develops over the next five years, it must at least be equal to the best anywhere, particularly if it wishes to export successfully. Since upholstery is something of a fashion industry, with designs changing as materials and technology develop and consumer tastes change, it follows that however well equipped the factories are, they must be capable of adapting quickly to these changes. This situation is in marked contrast to that in the corpus sector, which is highly automated and can therefore only produce standard models that vary little regardless of the factory.

In the case of the SZKIV organization, which with its factories at Kecskemét, Mohács, Debrecen and Siklós may be considered representative of the industry as a whole, the lack of a planned product policy is evident. The three major factories make, more or less, the same range of products, which seems strangely at variance with the system of centralized control exercised over them in the Budapest factory. Here, it would seem, would be a good opportunity to adopt a highly rationalized approach to design, product development, quality standards, materials selection and control and training, so that the concern would be able to cater for every sector of the market.

Product design

In their design and structure, products generally reflect the traditional approach to upholstering, which elsewhere has been abandoned as new materials and techniques have been introduced.

The conventional frame is based on solid wood members with dowel, mortise, tenon and finger jointing. It is therefore constructed on a massive scale to achieve reliability in performance. Research carried out to apply mathematical methods of structural analysis to rationalize the construction of frames and, incidentally, to save timber has proved successful, and the industry could use the results to advantage. For instance, the assembly of frames by means of

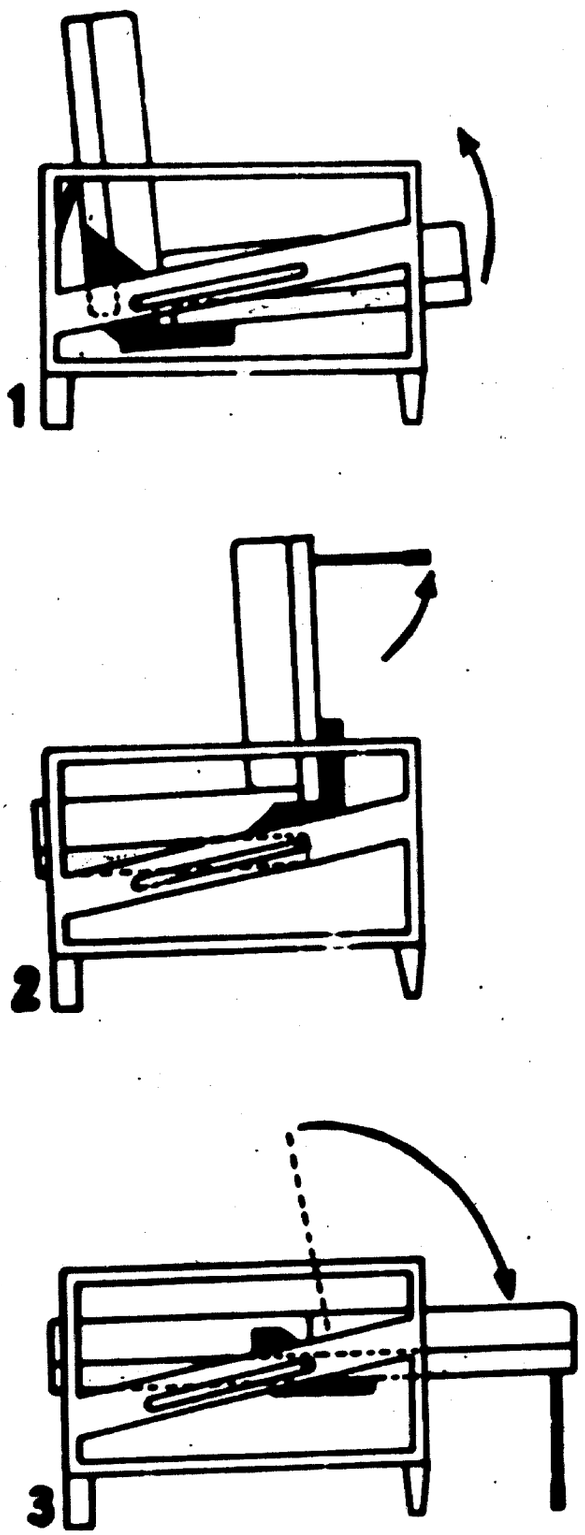
staples with the inclusion of some form of shear panel to provide the necessary stiffness is now commonplace. The exact method of construction depends on the frame's role and its performance in response to changing functional demands. However, ease of production and economy of materials are always the hallmark of the successful frame, which will incorporate suitable surfaces for supporting upholstery and fixing points for springs, castors and connectors.

A feature of practically every piece of fully upholstered furniture in Hungary is the use of the sprung unit as a base for seating. In the studio couch or convertible, the sprung unit is also incorporated in the back so that when it is converted into a bed, the load may be distributed evenly over the entire "bed" surface. To accommodate these units, it is necessary to enclose them in a heavy wooden box-like frame, which also provides storage for linen and other bed coverings. The result is a massive and unyielding structure that defies the attempts of even the strongest to move it, once it is placed in an apartment. Furthermore, because of its solidity, it is likely that the frame will long outlive the covering material.

The traditional fully upholstered suite consists of the convertible referred to above and two or perhaps three easy chairs manufactured in roughly the same way. Very few factories produce "show-wood" easy chairs, because "there is no demand for them". This is too bad, for such production would give much scope to designers and provide factories with a rational and profitable outlet for the undoubted skills of the work force. It is also likely that this kind of seating would prove a welcome alternative to the bulky three-piece suites offered to the consumer at present.

All manufacturers agree that an adequate substitute for the sprung unit would immediately revolutionize design in seating (see figure I). They point out, however, that while they are aware of the alternatives, these are not available on the home market, and import restrictions prevent them from being obtained abroad. The availability of suitable raw materials will be discussed later, but it is appropriate at this stage to point out that this kind of restriction is unrealistic, since setting up plants to manufacture these materials for the home market would not be economic in a country of Hungary's size. On the other hand, whatever may be the situation on the home market for seating, the industry will certainly find little or no sale abroad for its products unless it uses suitable raw materials.

Figure I. Convertible sofa mechanism



Whatever the material and structural considerations of seating, which will vary according to function and usage, all seating should have one thing in common, and that is the provision of some degree of comfort to the sitter. The comfort afforded depends on the shape of the surface between the sitter and the chair and the dynamic characteristics of the padded surfaces.

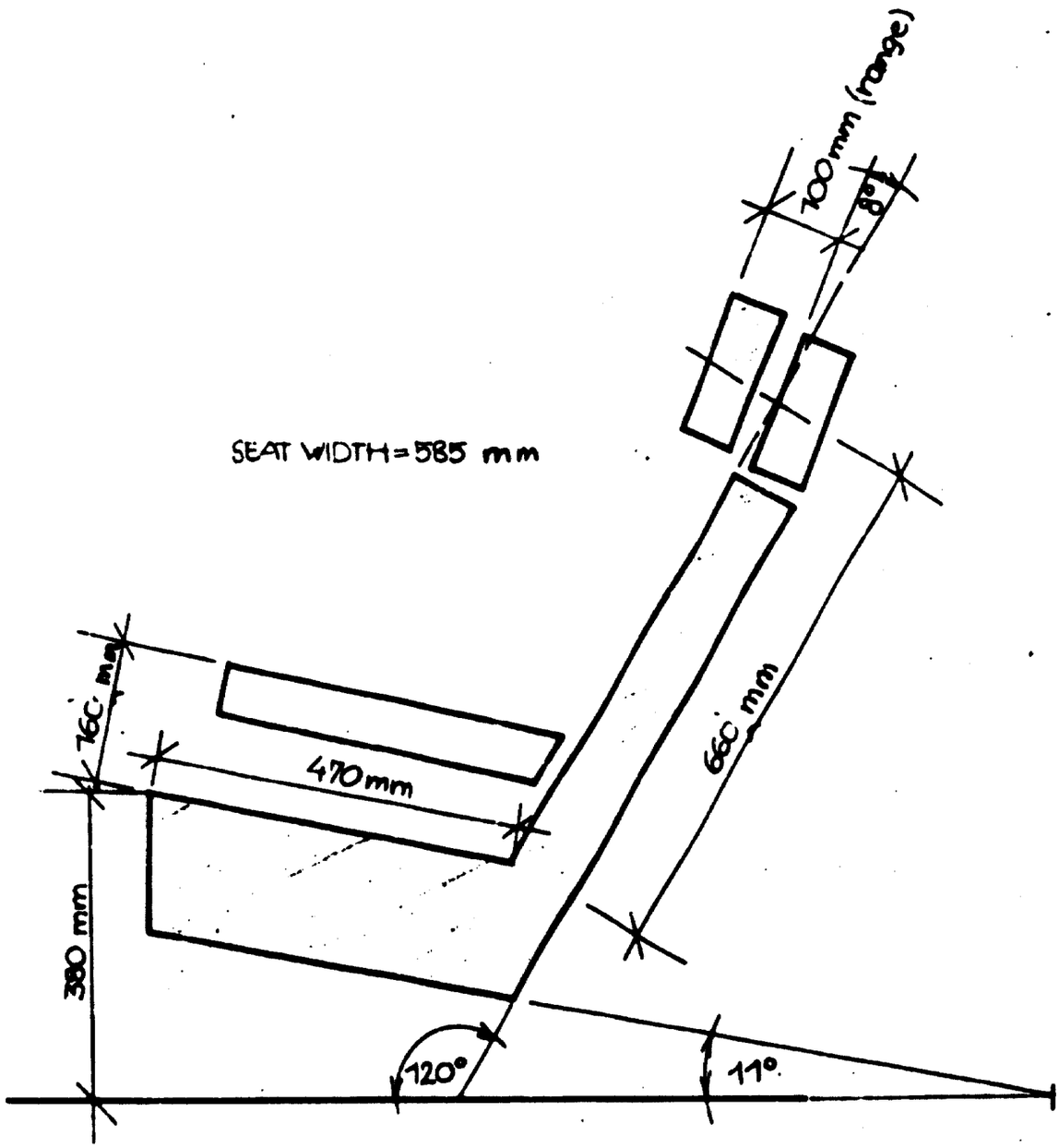
Research carried out by the Furniture Industry Research Association in the United Kingdom of Great Britain and Northern Ireland into the dimensional and anthroprometric aspects of comfort in seating indicates that despite the postural differences between men and women optimum values for seating that will cater for the adult population generally can be obtained.

Figure II shows the dimensions of a chair expected to give the maximum comfort to most people. The dimensions allow for a seat compression of 65 mm, and the preferred angles of rake and tilt fall between 115° and 130° and between 10° and 15°, respectively.

In dealing with design in relation to the industry's products as a whole, two questions arise: (a) do manufacturers know what good design is? (b) is there a critical and appreciative public? At present both questions must be answered in the negative. The industry is immune to competition from abroad both in price - this is ensured by the tariff - and in design. After many years of high protection of the domestic market, most consumers are quite unfamiliar with well-designed furniture. Furthermore, furniture is purchased so infrequently that consumers have no opportunity to acquire a background of expertise and appreciation in these matters. The decline in sales the industry is now experiencing has been referred to. It is unlikely once the immediate needs have been largely satisfied that there will be a return to the halcyon days when demand far exceeded supply. This could be disastrous for the home market, particularly when the industry is gearing itself to become more mechanised and therefore more productive.

The lesson is clear. If the design of the product is not improved, the industry will face an inevitable decline, and its prospects of penetrating foreign markets will disappear altogether. In relation to furniture design, considerations are quite specific. Design must take account of the production facilities of the firm; the skills of labour; an understanding of the characteristics of the materials used; and the form and colour of the article,

Figure II. Dimensions of the optimum easy chair



its tactile beauty, fitness for purpose, and decoration and acceptability to the consuming public. The danger of preoccupation with "imported" design, which invariably was meant for a different combination of manufacturing facilities, must be emphasized.

Present production depends largely on prefabricated materials such as rubber, plastics, foam, resilient webbing and various springing systems, which are often cut to size for immediate use. While this has undoubtedly facilitated quantity production methods, it has resulted in a loss of understanding of the qualities of the materials and their scope in design. For example, while as many of these materials as are available are incorporated in the convertible or studio couch referred to earlier, their use has not led to the modification of the design in any way, and it remains a relatively old-fashioned piece of furniture, difficult to handle and entirely unimaginative in appearance.

Even from the point of view of fitness for purpose, much of the upholstery produced cannot be rated very highly. Those responsible for marketing and sales do not appear to have ever undertaken any research or inquiry to discover exactly what consumers' furniture needs are. Because of changes in housing conditions it is extremely unlikely that the public wants the same types and forms of furniture as were current 50 years ago, but made from modern materials.

The remedy for this state of affairs lies largely with the industry itself. The view expressed by many manufacturers that they are simply producing what the public wants cannot be accepted. Many Hungarians have rarely, if ever, seen well-designed, modern Hungarian upholstered furniture; and when the public's choice lies between one poor design and another, its decision cannot be regarded as meaningful. An industry with a captive market virtually free of all foreign competition has a duty to the public to offer the best product it can.

It is not that there is shortage of good designers in Hungary, or that a school of native design is lacking. It is simply that the designers employed by the industry do not for one reason or another enjoy the freedom of expression essential to good design; in most cases they are employed mainly as draughtsmen. Thus, qualified designers have little incentive to work for the furniture industry, and most of those who are trained in the Art School of Industrial Design in Budapest find employment in interior design offices and elsewhere.

The State can play a more positive role in fostering good design. As the largest single customer of the industry, both as regards its own institutions and, for instance, the hotel industry, it is in a position to insist on high standards of design in the furniture it buys.

Raw materials

In upholstery manufacture, raw materials can account for as much as 80 per cent or more of the cost of manufacture and are therefore a basic element in both design and production considerations. Furthermore, it follows that if Hungarian manufacturers do not have access to the same sources and quality of raw materials as their competitors abroad, then it is unlikely that they will make any real impact on the export markets at which their produots are aimed.

Most of the design deficiencies already referred to can be traced to the fact that manufacturers are obliged to purchase materials locally, which limits them severely. For instance, there may be only one supplier of foam, one supplier of webbing and wave springing, and one or at most two suppliers of covering materials.

The raw material manufacturers, however willing, cannot be expected to meet more than a fraction of the needs of an industry that thrives on a variety of materials. Nor can they meet design requirements or prevent competitor inroads on their markets.

Attention has already been drawn to the dreary sameness of much of the Hungarian upholstery produced today. This is because apart from design considerations such as aesthetics and fitness for purpose, the products themselves must be made on the basis of a sprung unit, two or three types of plastic foam and a range of covering materials that every manufacturer uses. Some factories do import small quantities of foam and textiles, but the high import duties on these materials are a severe and effective deterrent. The expert discussed this problem with representatives of Északmagyarországi Vegyiművek, manufacturers of foam cushioning in Hungary, 90 per cent of whose output goes to the furniture industry. They fully acknowledge that they cannot provide for all the foam needs of the industry because their capacity is limited and demand exceeds supply. They assured him, however, that in about one year they would be able to supply Hungarian manufacturers with the same volume and variety of foams as are available to Western European manufacturers, including rigid chair shells.

Meanwhile, the manufacturers must, it seems, be prepared to wait until this eventuality occurs, unless those responsible for imposing duties on the import of essential raw materials take a more realistic view of the industry's problems and are prepared to assist in solving them. The replacement of the long outmoded sprung unit by appropriate foam cushioning, resilient webbing and wave springing would have a dramatic effect on upholstery manufacturing from design through to production and marketing.

It cannot be argued that these substitute materials will not perform as satisfactorily as those they are replacing. Apart from the severe standards to which they are subjected by the various standards specifications, which are now international, they have already been sufficiently long in service to have proved their worth. Furthermore, anyone with a knowledge of the industry who has attended the international furniture fairs of Cologne, Brussels, London and Copenhagen should know how effective these materials have been in raising upholstery to the highest international standards.

The view that there should be different standards in terms of design and raw material usage for exports and goods produced for the home market should be rejected. The legitimate fostering of the Hungarian industry should not mean inflicting poorly designed products on consumers. Nevertheless, a start could be made with exports because there is no justification for imposing import duties on materials that, when further processed, will be re-exported in the form of finished goods. The removal of such duties would not only improve the prospects for exports, but could also inject badly needed life and vigour into the key element of design. It would also have the equally important effect of encouraging the home producer of raw materials to expand his range to reflect more accurately the needs of his customer, the manufacturer.

Loose, reversible cushioning is a further variation available to both the designer and the manufacturer once the latter has been released from the encompassing coils of the sprung unit. These cushions are now invariably filled with a core of polyurethane or latex foam, around which is wrapped one or more layers of polyester fibre batting, which is held in place with a woven or knitted scrim cover fabric.

Polyester fibre is produced in many forms, most of which are used for outside cushion filling for textiles or for quilted garments and sleeping bags. The number of types being used for cushion filling is limited at present to about four.

The difference between types is achieved primarily by crimping the fibres in different ways, the main forms being a two-dimensional "saw tooth" crimp. Further variations can be achieved by varying the number of crimps per unit length, the amplitude of the crimps and the thickness of the fibre. These variations result in cushion fillings with differences in initial feel and possibly in performance. However, too few of the various types of filling fibre have been evaluated to draw any firm conclusions regarding the differences in properties of the different fibre types. The expert suggests, therefore, that the manufacturer be consulted for advice on the most suitable fibre for a specific application.

Figure III shows a complete cushion unit with single fibre wrap.

The most acceptable springing medium is undoubtedly resilient webbing (see figure IV). This is a flat rubber, textile-reinforced spring that is economical to use and provides an effective answer to a wide variety of seating design problems. The webbing is compact, silent, rustfree and durable, accelerated ageing tests having shown that it will withstand the equivalent of the average human weight sitting on it 100 times a day for 90 years with no appreciable loss of resilience.

It is generally available in two types, one of which has the elasticity to provide firmly sprung seats where a deep deflection is not required and is the correct type for seats and all large springing areas such as divans and convertible settees. The second type has greater elongation to enable softer seating to be achieved.

Attachments to wooden frames can be made by staples, improved upholstery tacks, nails or steel clips, and they can also be hooked to metal frames. A further development of support for cushion seats and backs is the four-point platform, which provides a high degree of comfort, buoyancy and support. Ethylene propylene, a tough material developed for the building and civil engineering industries but with the appearance and resilience of rubber, is used for the platforms. (See figures V-VII).

Production

Those responsible for the direction of production in practically all factories are professionally trained wood engineers. It is not surprising

Figure III. Complete cushion unit with single wrap

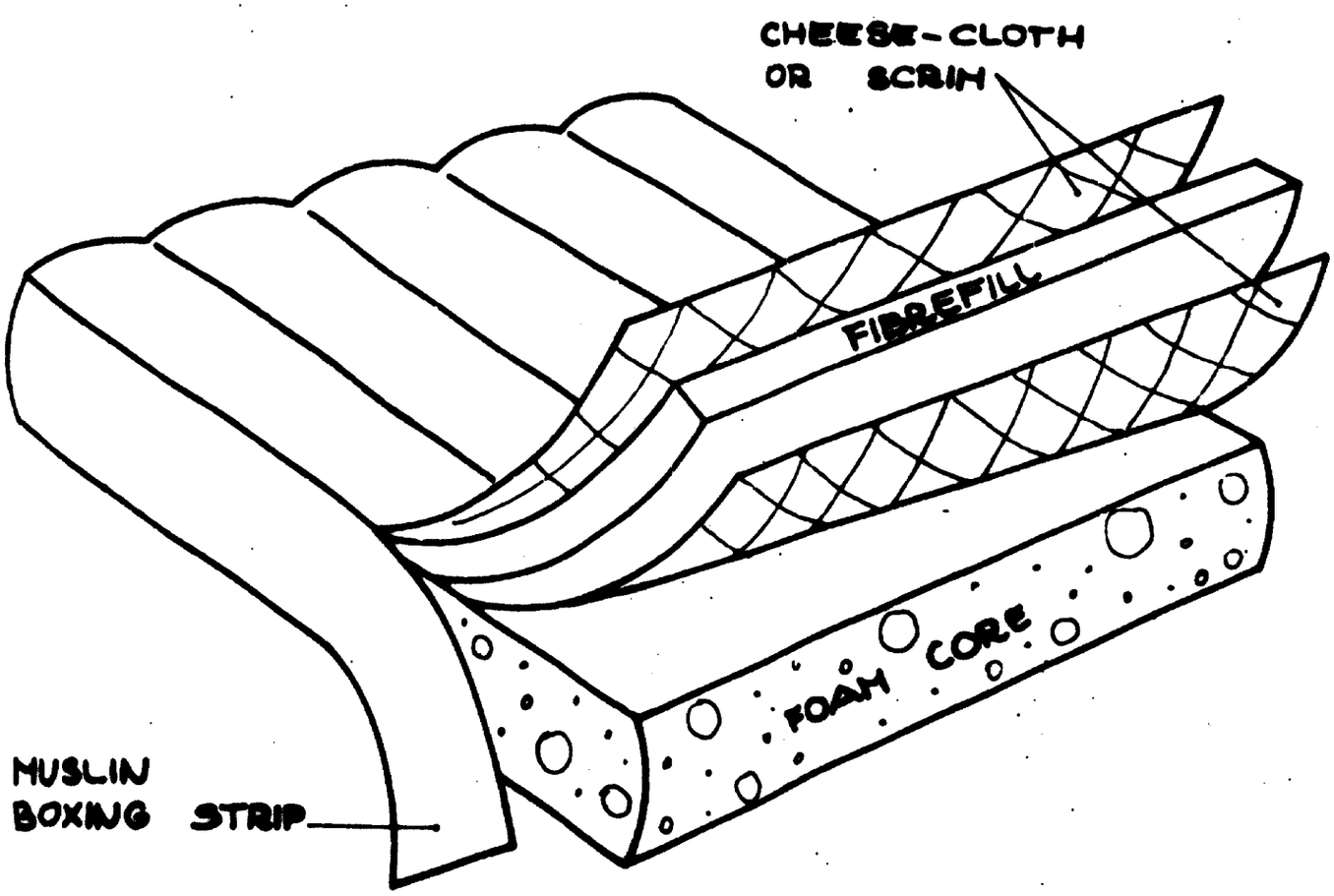


Figure IV. Resilient webbing used in easy chair

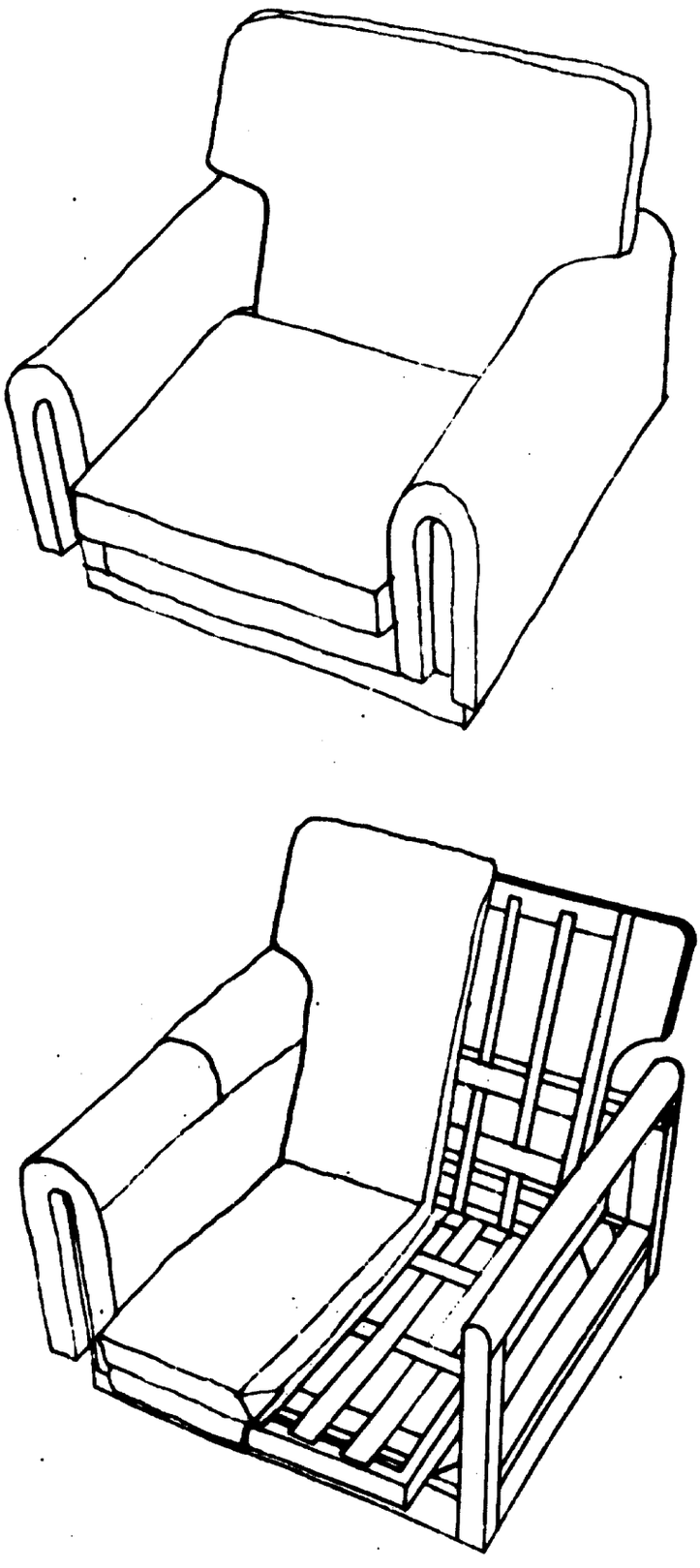


Figure V. Fixing methods for resilient webbing

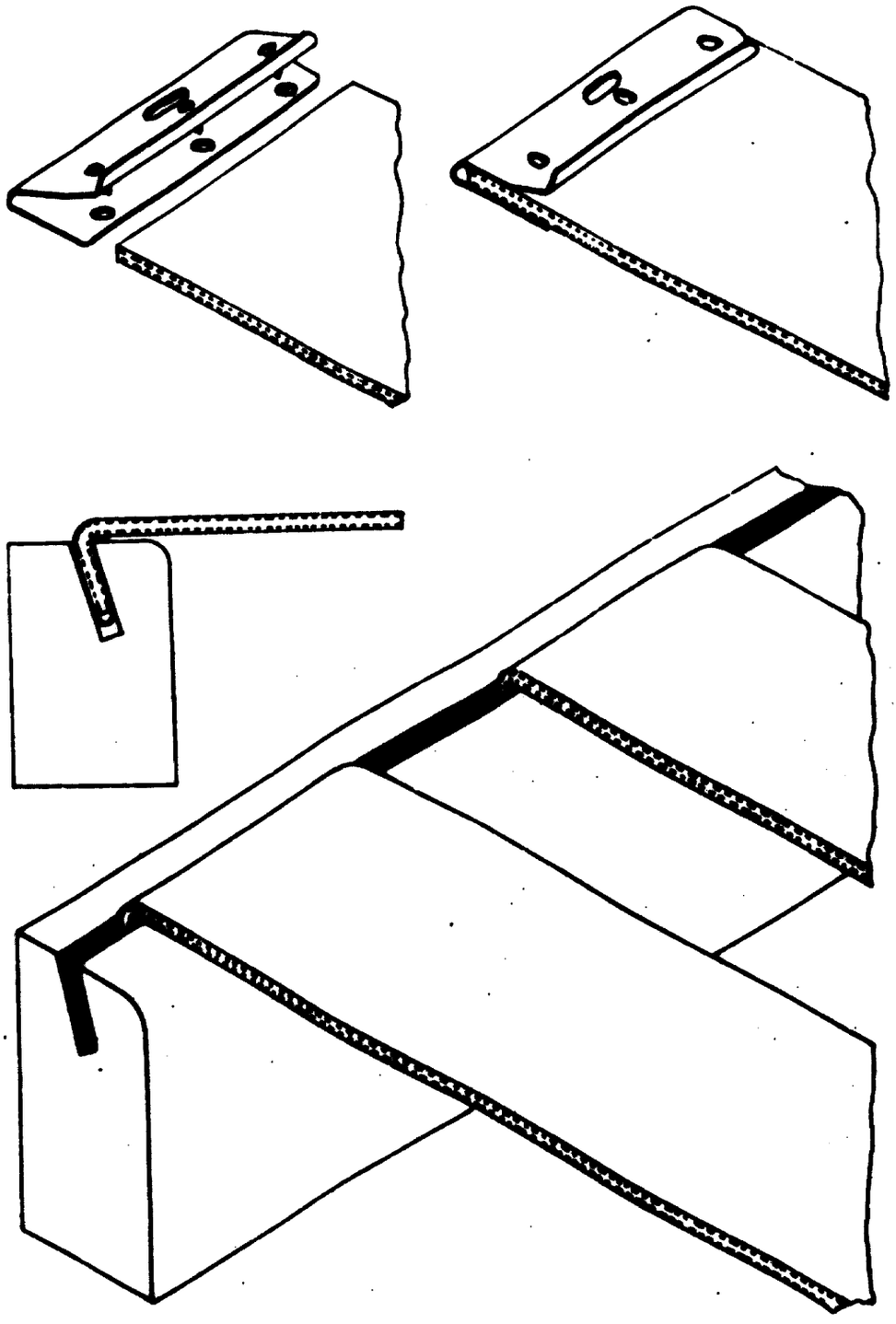


Figure VI. Example of platform support

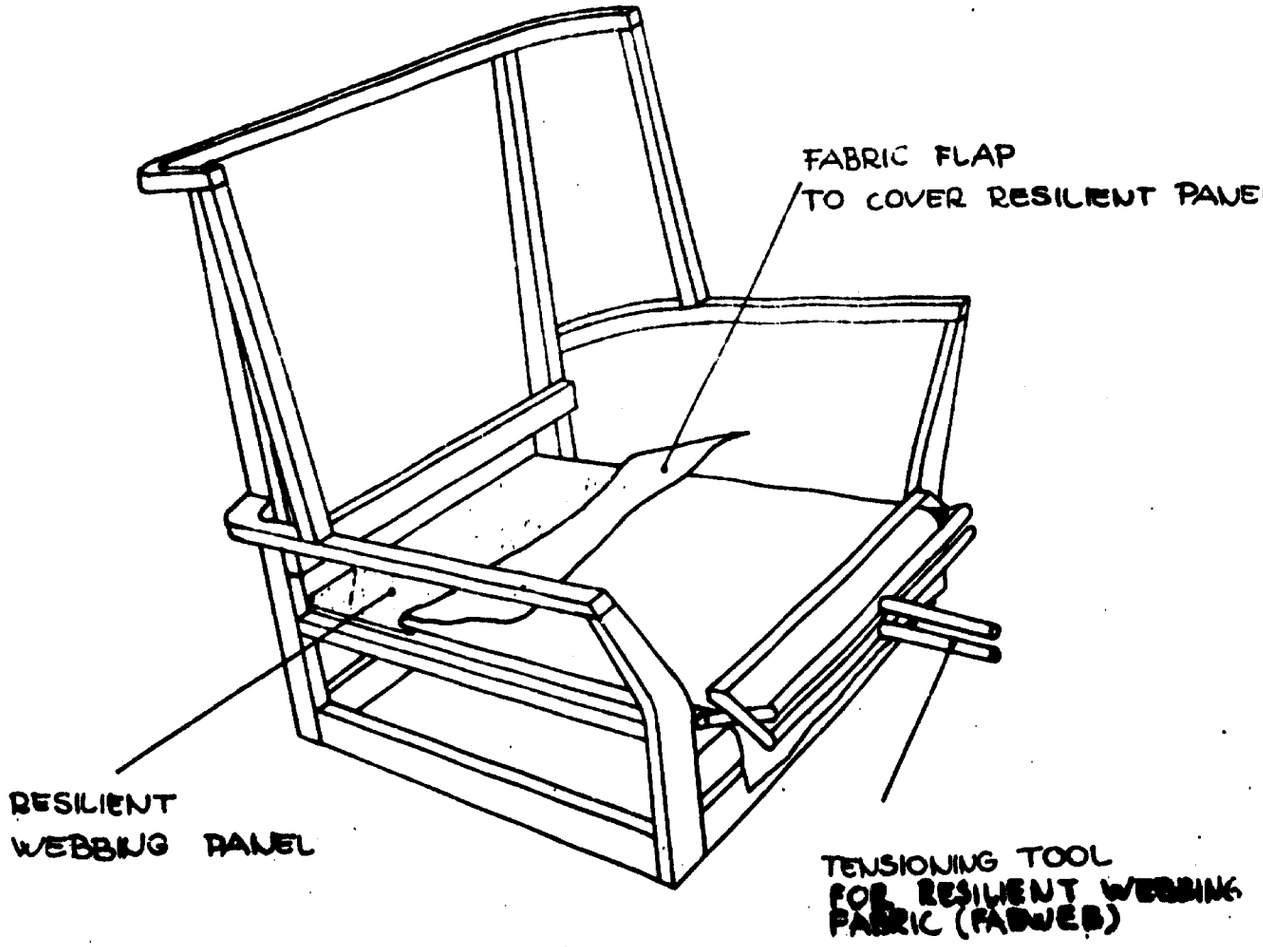
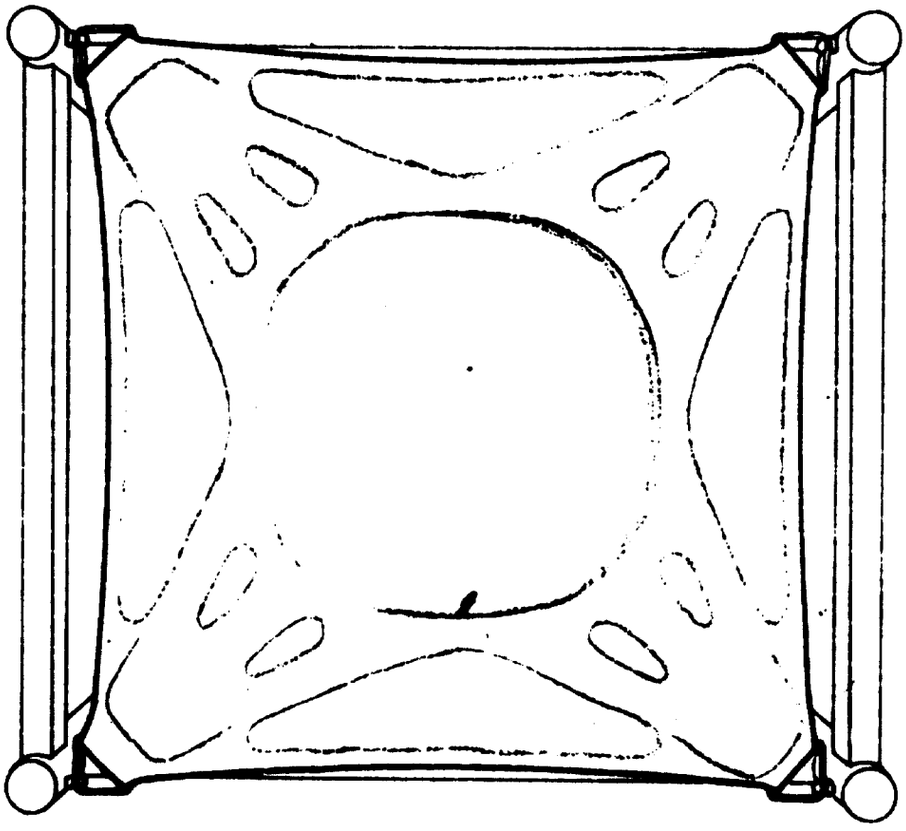
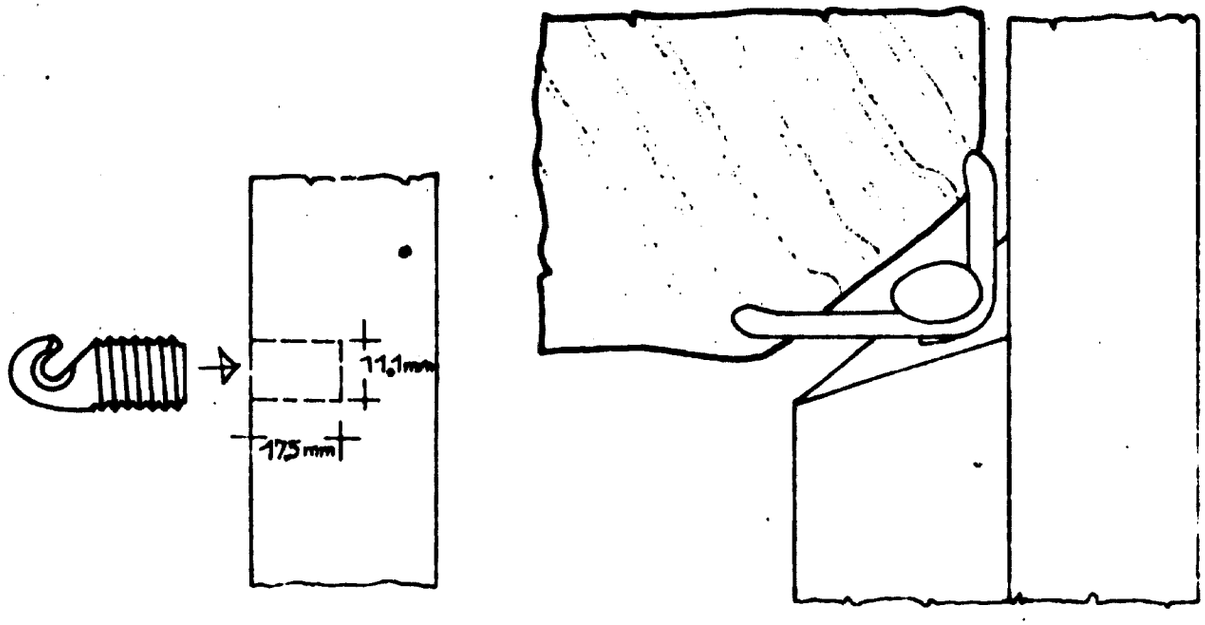


Figure VII. Example of four-point platform seating support





therefore to find the frame-making and corpus sectors of the factories particularly well organized both as regards work study and production planning and control. This is also due in no small measure to the highly rationalized range of models produced and to the modern and sophisticated equipment used.

The same degree of product rationalization should apply in the upholstery sectors of the factories; but the principles of mechanization, layout, materials handling, storage and intelligent use of space seem not to have been applied similarly effectively, perhaps because the engineers' time was taken up completely with corpus production or because the traditional nature of upholstery production was judged to be unsuitable or unresponsive to the more advanced forms of production techniques. Whatever the reason, the engineers have clearly paid far less attention to upholstery production than it deserves, and they should now make good that deficiency by coming to grips with the problems involved realistically.

The objective of the present assignment was to advise and assist in particular the SZKIV organization, but it can be assumed that the comments and recommendations that follow apply equally well to the other upholstery factories visited during the initial stages of the assignment. In almost all cases the expert found that working areas were organized completely informally, with very little attention being paid to work flow or job analysis. Consequently a great deal of time and space was wasted by operatives working haphazardly. Even without considering new equipment, most factories could benefit by an analysis of their production and the grouping of operatives or jobs by common elements, so that standard times could be more easily determined, production and quality control made easier and methods simplified through a more uniform engineering approach.

The sequence of operations concerned with upholstering may be summarised as follows:

Fabric receipt and inspection
Storage and handling
Laying up
Marking and cutting
Sewing
Buttoning and quilting

Foam cutting, jointing and profiling
Cushion filling and closing
Springing-up and padding
Upholstery assembly
Final fitting, e.g. movements, castors and glides
Packaging and dispatch

Fabric receipt and inspection

Detection of the fabric faults, which in the past did not occur until the material was being laid up on the cutting table, has taught manufacturers the importance of inspecting the fabric when it arrives at the factory from the supplier. The faults include variations in shading, creasing, bowing of yarns, cloth marks, broken threads, water marking, to name but a few. At all events, they are sufficiently serious to warrant the introduction of an inspection system that will ensure rejection of the fabric at the earliest possible stage.

Inspection usually consists of winding the fabric across an illuminated, inclined table. Lighting must be adequate and adaptable to the type of fabrics being viewed, and it must be capable of revealing both surface defects and broken threads, holes and the other defects to which such fabrics may be subject. The cloth can also be measured during the winding process and on being rewound can have a paper measuring tape included, which will indicate during subsequent cutting processes the exact amount of fabric remaining on the roll.

Inspection devices are available from specialist suppliers, but can be designed and produced by the product development department of the factory.

Storage and handling

The fewer the variations in the colour and patterns of upholstery fabrics, the fewer are the problems of storage and handling. Few colours and patterns are used in Hungarian upholstery at present, but as the industry introduces a greater variety of fabrics in the future it will have to pay greater attention to storage and handling. Various methods of storage and handling can save space, improve efficiency and reduce labour costs.

Considerations that influence the selection of a particular storage system include ease of access, the need to keep the fabrics clean and dry, and mobility.

A widely used storage method is to stack up paper or plastic tubes between existing walls or upright framing to form a pigeon-hole system. Tube diameters of up to 350 mm are suitable and will accommodate normal rolls used.

An alternative is to use a mobile storage system. Rolls of fabrics are kept permanently mounted on trolleys. Six or more rolls are accommodated on each trolley. The fabric is tensioned by unwinding it around the guide bars.

More sophisticated and proprietary systems are available from specialist suppliers, the names and addresses of which have been supplied to the SZKIV organization.

Laying up

Because of the limited range of models and of covering fabrics, Hungarian manufacturers can cut up to 40 lays simultaneously. In all cases, the cutting tables have been made in the factory and are effective to a greater or lesser degree according to the ingenuity of the upholstery supervisor who designed them. Some incorporate a simple overhead conveyor system mounted on wheels for transporting the fabric along the entire length of the table, while others simply depend on the operative's skill in spreading the fabric manually.

Fully mechanized laymakers are available, but before an investment in such a machine is contemplated, many of the existing laying-up devices can be improved to increase accuracy in cutting and productivity.

The first important consideration is the dimensions of the cutting table, which in length and width must conform to the average dimensions of the fabric being cut, which in turn are governed by the design and requirements of the model. Tables then can extend for upwards of 25 metres. The table top should be covered with a smooth, non-wearing material such as heavy-quality linoleum and have a measuring rule fixed along its length as an additional aid to measurement checking. Shorter tables should also be available for random cutting and loose-seat cover cutting.

Any particular lay should contain only fabrics of equal width and similar cutting and stretch characteristics. Furthermore, the outside of the lay should be stabilized by using toggle clamps that can be fixed to the outside of the table. The inside of the lay can be held in place by using weights or

needles. Where fabrics tend to bunch together when being cut, an underlay paper should be laid on the bottom so that the fabric is carried to the base of the knife by the paper. Spreading should always be done from a cradle or fabric-unwinding wheel to avoid tension in pulling.

An efficient aid to laying up is to use an end-cutting-off device. This consists of a circular knife mounted in a groove or an adjustable bar located near the fabric unwind. The leading edge of the cloth is pulled over the bar to the other end, where it is clamped. The cloth is cut and the next layer laid up, and so on.

Marking and cutting out

Whatever marking and cutting system is used, and there are many to choose from, it must have as its aim (a) to cut the maximum number of shapes in the shortest possible time; (b) to maintain or improve the accuracy of cutting; and (c) to achieve maximum utilization of materials. Because of the multiple lay system prevailing in the industry, miniature lay planning would appear to offer the best solution. Indeed, at least two firms have already used this system, and its use is recommended to all other firms involved in volume production.

First, the original size patterns are reduced to exact miniatures in a 5:1 ratio and arranged to give the most economic cutting lay. As the scaled patterns and the planning area are quite small, the most economical cutting arrangement can be arrived at quite easily and quickly. A photographic print is then taken that acts as a cutting schedule and as a permanent record for estimating future requirements and planning.

Pattern boards should be made from a non-wearing material such as plastic laminate and should be marked and stored in a pattern "library" underneath the cutting tables.

For multiple lay cutting, the straight reciprocating knife cutter is the most accurate and versatile, but should be capable of being fitted with a variety of blades - straight, wavy or saw-tooth - according to the cutting needs of the fabric. All cutting machines should have dual-speed motors and a variable cutting stroke, particularly where it is necessary to cut narrow radii.

Another marking system now becoming popular in very large upholstery firms is the paint marking system. Paper patterns are laid over the fabric lay and

fixed in position by a net frame with an open mesh. A paint-dispensing unit moves along the lay length, and the paint is dispensed in a fine mist covering the lay completely. Since the paint dries quickly, the pattern papers can be removed quickly, leaving a sharp cutting outline for the cutter.

Sewing

It is not surprising that firms in general do not experience many technical problems in sewing, but this has more to do with the level of technology currently practised by the industry than with the degree of sophistication that will become necessary as the industry develops and expands.

In other respects, the expert found sewing to be the activity that has received probably the least attention, particularly in terms of work study, and, as a result, productivity. Elsewhere, to produce a satisfactory range of style effects, upholstery firms have had to invest in several types of machines, many of which are used only intermittently. The increased variety of covering materials with significantly different sewing characteristics will also increase the frequency of machine change-over or adjustment. It is necessary, therefore, to take all these factors into consideration when planning for increased productivity and the introduction of new processes and techniques.

The result of an investigation into the activities concerned with the sewing trades carried out recently by the relevant research association of the United Kingdom has a significant message for the sewing sector of the upholstery industry here. It was found that only 10-20 per cent of the total working time is actually spent on making stitches, the remainder being taken up mainly with materials handling, which is non-productive. It follows, therefore, that if more successful work study is applied to the handling aspect, it will be reflected in more time being spent in sewing and thus in achieving greater productivity. The elements involved in the sewing cycle are:

(a) Pick up materials and position;

(b) Sew, reposition, sew;

(c) Cut threads and dispose of sewn material.

In the case of (a) and (b), the sewer should be so serviced that the cut materials are easily available to her on suitable racks, and when she has finished sewing each set of covers, additional transportable racks should be provided for their removal.

Since much upholstery involves the sewing of large, awkward and heavy materials, greater attention to the design of the table surrounding the sewing machine could improve the handling problems considerably. Its surface should be extended towards the left and front left-hand side, so that the length of the continuous seaming may be increased without stopping, and large panels may be prevented from dragging over the left-hand edge. Figure VIII shows the dimensions suggested for such a table.

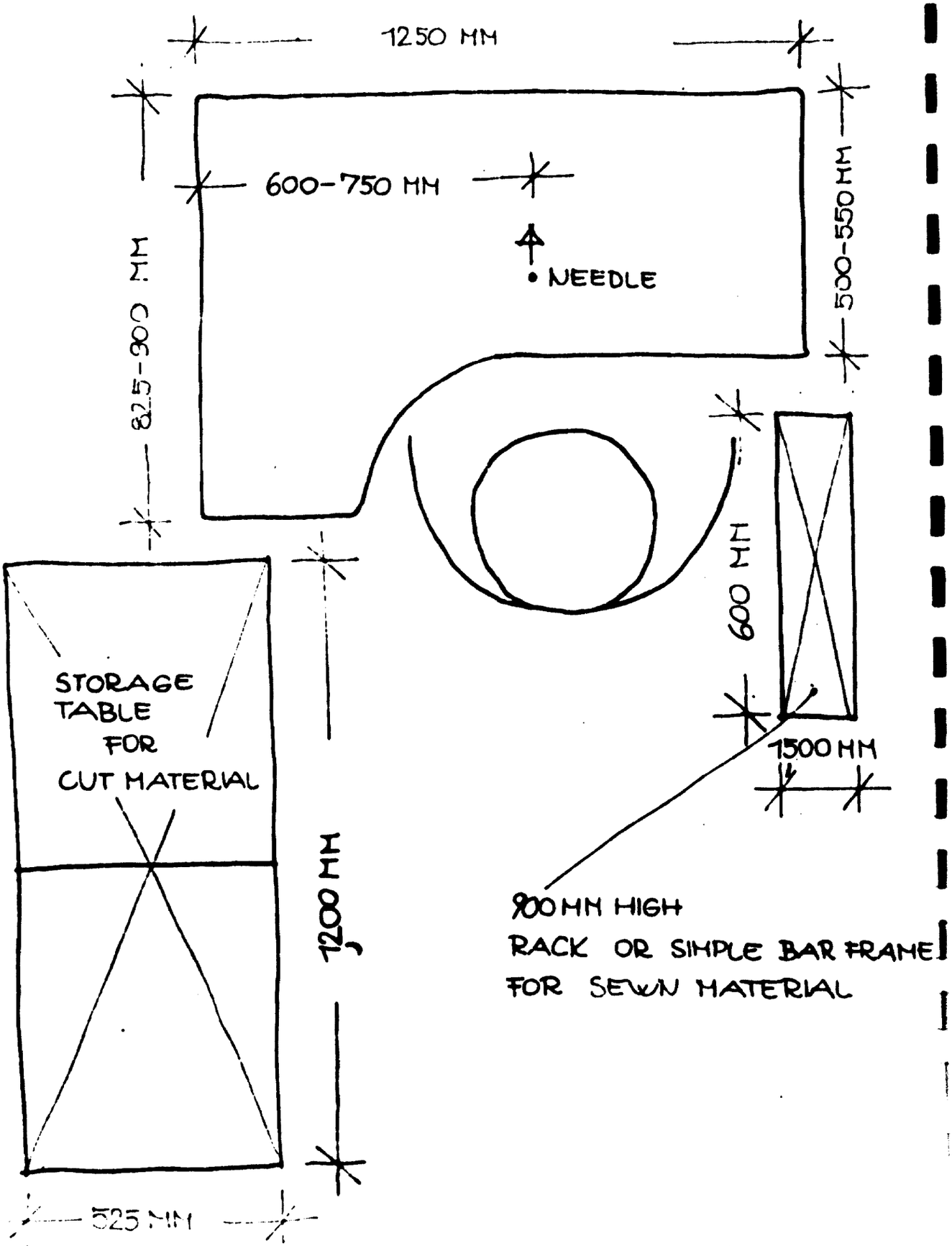
Special automatic attachments on the sewing machines themselves can eliminate a great amount of time in guiding, handling and trimming the thread. Other aids that should be incorporated in sewing machines, and which would improve productivity, include needle positioners and pneumatically operated thread and tape guillotines.

In addition, there are machines that are capable of inserting zippers, tapes and piping with puller feeds for sewing long or repetitive seams such as continuous zippers. The puller feed assists in pulling the sewn materials evenly through the machine without rocking or sideways movement.

There are also special-purpose machines for gathering round curves and gathering to a fixed length with a differential feed that can vary the top and bottom plies relevant to each other. Some of the latest models now have the extra facility of engaging or disengaging the gathering or stretching action, so that straight-curved-straight seams may be sewn without interruption. Other proprietary machines are available for sewing and folding side panels in one operation; making and inserting piping in one operation; inserting zippers on a continuous or fixed-length basis; attaching binding or reinforcing tapes to filled cushions. Also cushion-closing machines are available using either a cylinder bed arm or cup feed to facilitate sewing the edge of the closed cushion.

Particular attention to the layout of the sewing and cutting room, especially with regard to the use of space and the location of each cutting table and sewing station, will facilitate an ordered work flow. When practicable, cutting and sewing should be carried on in the same area with both activities grouped according to the nature of the work and the prevailing production system. An allowance of 6 m^2 should be made for each sewing station to include an aisle and access. Since repetitive sewing is monotonous, it

Figure VIII. Sewing station



has been found helpful to have alternate machines in the line facing in the opposite direction; and since many sewers complain of cold feet in winter time, underfloor heating would remove this hazard.

Figure IX gives a typical layout for a cutting and sewing room.

Quilting and buttoning

The industry carries out relatively little quilting and buttoning, although both are now firmly established techniques in upholstery. They can not only provide a degree of individuality to a series of models, but they also perform an important function in relation to design and the use of particular covering materials.

There are now many proprietary machines available for both purposes incorporating a greater or lesser degree of mechanization, and it is important, therefore, in selecting the most suitable that all special requirements of each design are catered for. The quilt itself is a filled panel of fabric, where the stitching not only holds the materials together, but also provides a decorative patterned effect. The depth of quilting can be controlled to give extra deep tufted effects, shallow or raised effects for embroidered or trapunto outlines.

For relatively small panels, a conventional heavy-duty sewing machine may be used, but care should be exercised in selecting the most suitable thread and needle, which must penetrate combinations of cover filling and backing cloth in thickness up to 50 mm or 75 mm.

For larger areas, a long-arm sewing machine may be used, but it is important to recognize the following limiting factors in its use in relation to quilting:

(a) The throat distance from the sewing head to the machine body, which limits the width of cover that can be quilted satisfactorily;

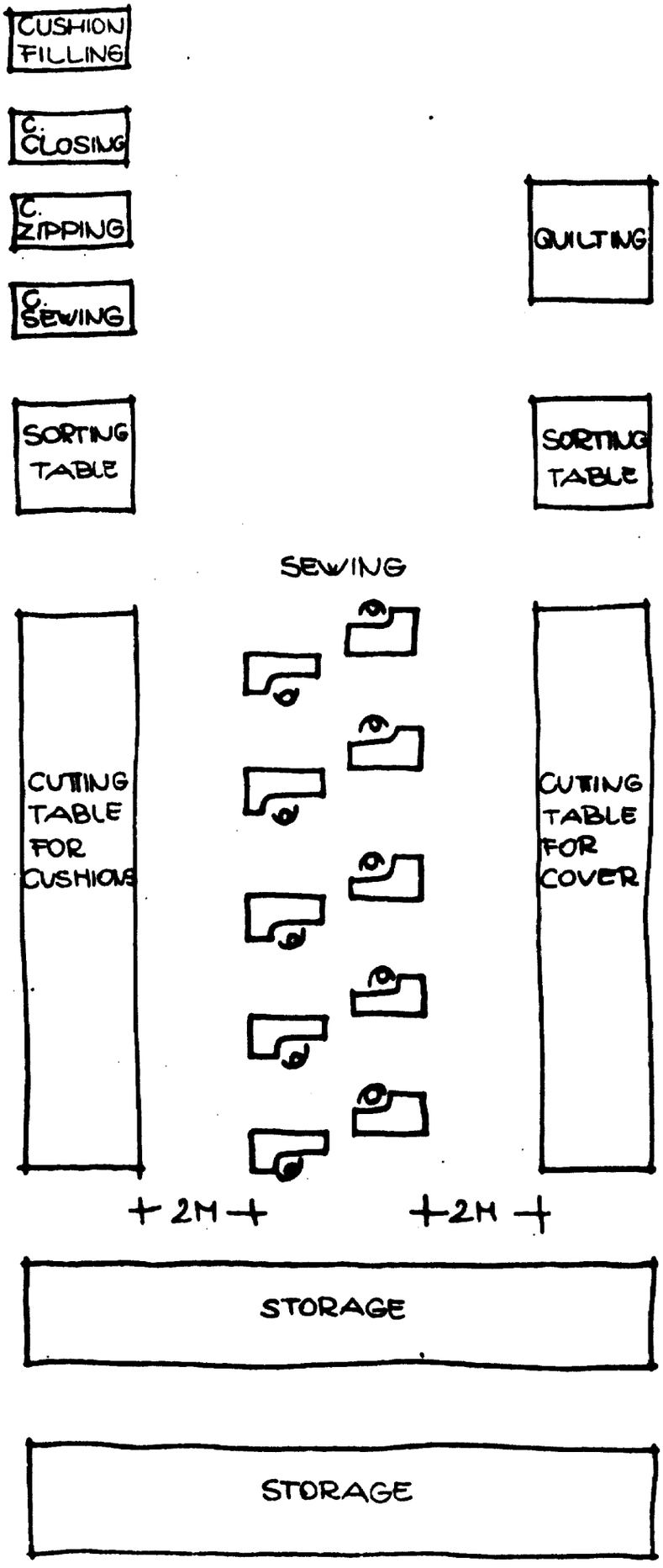
(b) Maximum needle and foot clearance, which limits the thickness of fabric to be sewn;

(c) Sewing capacity of machine as determined by the maximum needle and thread sizes that the machine can accommodate.

With regard to conventional machines for upholstery quilting, the following points should be considered in making a final selection:

(a) The maximum number of operators required to operate the machine. Many simply require one operator, who prepares the next frame while the previous one is being quilted;

Figure IX. Sohematic layout for cutting and sewing department



(b) Ease of loading. The frame size, weight and method of clamping and transport will contribute to its efficiency;

(c) The quality of stitching in relation to depth and straightness;

(d) Versatility in the design of the quilting. Special attention should be paid to its ability to adapt to curved work with limited radii;

(e) Cost of pattern formers and ease of design change;

(f) Amount of floor and operating space required by the machine.

Since multi-needle quilting is not used universally in upholstery, the expert would not recommend its introduction at this stage.

Buttoning has traditionally been a hand operation carried out by skilled craftsmen on fixed upholstery using traditional materials. Its popularity in relation to modern upholstering has completely changed that image, and the techniques now used are as advanced as any to be found in the industry. Up to now Hungarian upholstery firms have not adapted their approach to accommodate these changes, but as the need for buttoning develops so also will the need to use more up-to-date means of production.

The simplest method of semi-mechanized buttoning is to use a buttoning jig made from plywood or similar material. By attaching a suitable cramping mechanism, the cushion can be compressed, which leaves the operator's hands free to attach the buttons. For larger models, vertical jigging and clamping can be used to facilitate two operators working together on seats or back panels. There are now many buttoning machines available commercially with varying degrees of flexibility in their utilization, and a decision as to which is the most suitable for a particular kind of production will depend on the design being produced and the degree of mechanization required. The same observations apply in the case of button-covering machines, a wide choice of which is also available. However, careful attention must be paid to the kind of button used and especially to the button-linking system. Button failure occurs mainly in usage, is extremely difficult to rectify and can be quite expensive for the manufacturer should it occur after the goods have left the factory. There are many types of linking systems, including the conventional twines, pre-tied loops, chain links, straps and tapes, pin fasteners and pressers. Almost all have their advantages and disadvantages; each must be tested fully before being used for a particular application.

Upholstery assembly

Wherever possible, most firms use a sectionalized approach (i.e. a breakdown into various components and subassemblies) to frame manufacturing and subsequent upholstering. This undoubtedly speeds up production enormously, but the effect is offset considerably by the traditional approach to the upholstering techniques used. Working assembly areas tend to be organized on a completely informal basis, with very little attention paid to ergonomics or job analysis. Even without considering new equipment, most firms could benefit by an analysis of their production and the grouping of work by common elements.

Two pieces of equipment that offer many advantages to the upholsterer are the work holder and the work press. The former incorporates a vertical column with a universal ball-and-socket joint to which the work is attached by means of a suction holder or pneumatic clamp. The component is thus accessible from all sides and angles; the upholsterer has both hands free and can work in an upright position. The work holder can be adapted to suit any kind of subassembly or frame.

Work presses are used for all types of frames, including settees and convertibles, where it is necessary to hold the frame in a fixed position in a compressed state. Springing up can be done, also padding, and covers drawn over and stapled. Even castors can be fixed before the upholstered frame is released from the press.

Finally, there is the upholstery-assembling machine, which enables all upholstered subassemblies to be fixed together and does whatever subsequent additional work is required to complete the production cycle.

Standards specifications and quality control

Organizations responsible for the preparation of national standards and the maintenance of quality control for furniture are operating as effectively as possible, given the prevailing situation with regard to current raw materials utilization and product design. It is obviously not their function to introduce new designs, but to subject existing products to the performance standards laid down. Should the industry introduce new materials and techniques, they see no reason why they would not adapt existing standards to suit such changes. They would also be prepared to adopt existing quality control and test procedures currently used in other countries.

In any event, furniture being produced for export must conform to the standards of the country to which it is being exported. In the case of dining-room chairs, the only kind of seating so far sold outside Hungary, there have been few if any problems regarding standards.

These organizations could, however, assist the industry in considerably shortening the time it takes, often extending well over a year, for a new design on the drawing-board to reach the consumer. Such a reduction in time is in everyone's interest, producer and consumer alike. From a purely practical point of view, a long product development cycle can mean that by the time the product becomes a standard item, it will have lost its sales impact.

The best solution, and one that has found favour in other countries, is for the larger factories to install their own test equipment. This equipment is relatively cheap and can be operated under the same conditions and to the same standards as those existing in the national organizations. In this way not only would the whole process of product development be speeded up, but also more effective quality control procedures could be adopted.

There is no shortage of trained personnel in the factories capable of carrying out the testing and other quality control procedures effectively. They would probably require no more than a short, intensive training course to become familiar with all the requirements.

It is also recommended that these institutes maintain close relations with other similar institutes abroad, particularly the Furniture Industry Research Association in Stevenage (United Kingdom) and the Centre technique du bois in Paris. Both organizations have carried out a great deal of detailed research into furniture design and production, the results of which have proved beneficial to the industry throughout the world.

It is also the responsibility of standards and quality control organisations to keep the furniture industry informed of changes that may have been made in national standards specifications in other countries, so that the factories exporting to those countries may incorporate the changes into their products.

Annex IV contains a description of graded performance tests for seating, easy chairs and settees.

Research and development

Most of the research and development carried out on behalf of the industry seems to be done by the Furniture Planning Institute, which offers a comprehensive design, technical and management advisory service to the furniture industry and employs specialists in all aspects of furniture production from product design to completion of the model. It also offers a technical information service and produces a technical periodical for the furniture industry giving information on new materials and processes.

It therefore would be expected to play a key role in any reorganization and development of the upholstery sector of the industry planned for the current five-year development programme. To do this effectively, both the design and the upholstery technology sections of the Institute should be strengthened by additional personnel, so that they may be in a position to deal with the extra work load that a programme of this nature entails. The designers should be completely familiar with modern upholstery techniques and, with the assistance of the export marketing organization, ARTEX, and their colleagues on the technical side, should design and produce to the prototype stage a range of seating incorporating the latest developments in upholstery technology for adoption by the industry.

Since it is the function of the Institute also to provide a technical information service to the furniture industry, the Institute must remain abreast of all technical developments occurring elsewhere. It can do that in a variety of ways, but mainly by ensuring that it obtains copies of all relevant technical literature published abroad that could be used by the industry and by sending appropriate personnel to attend trade fairs such as Ligna in Hannover and Interzum in Cologne, and the various national and international furniture fairs.

The Institute could improve the quality of its presentation of technical information by including in its periodical a section entitled "New processes and developments", which would provide abstracts of technical innovations, brief descriptions of new machines and processes and other technical details in a stylish and interesting way, and thus encourage busy factory managers to seek further information. It would be desirable to include photographs and other illustrative material.

The Institute should also organize short, intensive courses on particular technical developments and innovations of special interest to the furniture industry. It should also organize for manufacturers study and fact-finding tours to furniture factories and institutions in other countries such as the Federal Republic of Germany, Scandinavia and the United Kingdom. Such visits would be extremely beneficial, particularly for those manufacturers contemplating the purchase of additional machinery and equipment. The visits would also provide the manufacturers with an opportunity of studying potentional markets at first hand.

Training

Since it is beyond the scope of this report to deal with every aspect of industrial training in upholstery production, it will consider only the training of technicians and training in design.

Training in design

Most training in design is done in the High School of Applied Art in Budapest. The curriculum, while not concerned specifically with furniture design, provides a good grounding in that subject. Nevertheless, few students who qualify seek employment in the furniture industry because there is little or no opportunity to practise their profession, and the few who do work for furniture factories find themselves to be little better than draughtsmen.

Considering the general lack of design appreciation in the industry and the urgent need for the introduction of new designs, this situation is indeed a great pity. Obviously, the fault lies with the industry, which appears to be neither anxious nor willing to give designers the freedom to express themselves or use their skills in designing furniture worthy of the long-established Hungarian tradition in this field.

There is very little contact between the industry and the design college. Apart from the fact that good design training needs a close link with industry, many other benefits would accrue to both groups through close collaboration and the recognition that each can and must support the other. At least one if not two places in the design class each year should be set aside for students from the furniture industry who have the aptitude and ability to

become furniture designers. These students should be supported during their period of studies by special scholarships provided by the industry, and when they have qualified, they would naturally return to work in the factories that sponsored them.

Other ways in which the industry could assist, as well as ensure that designers are given training relevant to the needs of the furniture industry, include opening its doors to design students to work in factories during holiday periods, providing the design college with materials and special equipment for practical classroom work and encouraging both students and teachers to visit factories, particularly when new equipment or a new technology is being introduced. A representative of the furniture industry should sit on the council that governs the activities of the college to ensure that the design interests of the industry are maintained.

Upholstery technician training

After training in design, the training of suitably experienced personnel as upholstery technicians and technologists may be regarded as the next greatest need of the industry. Most of the present upholstery technicians in the factories would be the first to admit their shortcomings in this respect. Having completed their apprenticeship and worked as journeymen upholsterers, they have found themselves placed as managers in upholstery departments with little or no preparation or training for this kind of work, which differs in many ways from that of a craftsman. Even traditional upholstery processes and techniques have now changed radically, and the principles of work study, production planning, and foam and textile technology are much more appropriate to the upholstery manager of today than a detailed knowledge of the craft.

Of the many factories the expert visited, the best managed was one having a supervisor whose background and training were in the clothing industry. This is not surprising, since the two industries have very much in common, particularly with regard to tailoring. Many of the techniques used in the garment industry could be used advantageously by upholstery managers if they wish to produce a well-tailored product.

The most suitable beginning of training as an upholstery technician/technologist who may also wish to specialize in management is a good

apprenticeship in the upholstery trade. It should last about three years, during which the apprentice would become competent in every aspect of upholstery; subsequently he would spend about one year as a journeyman upholsterer before attending a full-time course in upholstery technology. This course would last about one year and would include the following subjects:

Upholstery plant layout and design

Problems in industrial plant design as applied to upholstery manufacturing

Building structures, equipment, location, space utilization, power utilization, light, heat, ventilation and safety

Materials handling

Maintenance

Upholstery equipment

Equipment for fabric inspection, laying up, marking and cutting, sewing, buttoning and quilting, foam cutting, jointing and profiling, cushion filling and closing, springing up, assembly, packaging

Capabilities and limitations of machines

Theory and practice of cutting and sewing

Low-cost mechanization, pneumatics, electrics and hydraulics

Upholstery processes

Processes for cutting fabrics, matching, sewing, springing, finishing, reconstituting foam and other filling materials

Engineering economy

Criteria and techniques for management decisions in relation to economy of design, selection and operation, effects of depreciation policies and machine replacement

Upholstery manufacturing and processing

Production methods in upholstery, including procedures for all operations from receipt of raw materials through packaging and dispatch

Raw materials technology

Basic raw materials, including textiles and natural and imitation leathers and polyvinyl chlorides

Cushioning materials, including latex and polyurethane foams

Resilient webbing and other seating support materials

Quilting and buttoning materials

Needles and threads for various sewing techniques

Springing materials

Stapling, nailing and fixing

Manufacturing controls

Development of principles and procedures for control of materials, manpower, and costs with special attention to production and inventory control, equipment utilization, earnings classification and cost-reduction programmes

Quality control

Economic balance between cost and value of quality

Statistical theory as applied to sampling, control charts, tolerance determination, acceptance procedures and control of production

Marketing

The Hungarian market

Although no detailed statistics are available giving furniture sales through various types of retail outlets, it is clear that most furniture sales are made through large furniture stores such as Domus. In contrast, in Western Europe a high proportion of sales are made through high-quality small specialist furniture shops, which promote an awareness of design and a comfortable living style related to the furniture they sell. Small speciality furniture shops are rare in Hungary. The standard of display in the large, overcrowded furniture showrooms is poor. Furniture, especially high-quality furniture, where it exists, is rarely displayed to its best advantage, and sales no doubt suffer as a result. Promotion of furniture, including consumer advertising, seems to be given a low priority, and total promotional activity compares very unfavourably with retail promotion of furniture in other European countries.

Marketing management

Two separate and distinct organizations are responsible for marketing and therefore marketing management, namely, ARTEX, the furniture export marketing group; and Butorértékesité Vállalat, which is responsible for the home market and sells 86 per cent of the industry's output.

Expertise, particularly in marketing management, seems to be lacking, and the formulation of marketing policy apparently receives little attention. This is no doubt due to the initial revival of the furniture industry and its preoccupation up to recently with fulfilling a basic need of consumers. However, this situation has altered considerably, and the furniture industry, to maintain and develop its markets both at home and abroad is reverting to the accustomed role of having to promote its products, which are in competition with other consumer merchandise.

The marketing organizations should then be expected to play a key role in assessing the potential of these markets and advising the industry accordingly. Elsewhere in this report it has been emphasized that successful design depends not only on the input of the designer and the manufacturing facilities available, but above all on accurate information concerning the requirements of the specific market for which the product is being designed. Market intelligence of this nature can come only from a detailed knowledge of consumer tastes and trends, which in turn cannot be obtained without a careful analysis of the market place. It is a special expertise for which intelligent guesswork or long experience in "selling" is no substitute.

Thus, the marketing organizations will have to update their selling, marketing, and promotional techniques at least to the level being used by their potential European competitors of similar size. Market planning, the definition of the market segment at which a manufacturer's products are being aimed, the establishment of sales targets, more investment in quality sales literature, sales representation, point-of-sale display material and brand advertising are all areas in which the Hungarian product must compete effectively. In addition, the industry as a whole should promote an image of good-quality Hungarian furniture on the home market.

Upholstery manufacturers capable of producing furniture that can sell on the basis of design and quality should insist on being better informed of export market opportunities, and should set their entry into the Western European market as a short-term objective. Furthermore, only high-quality, well-designed upholstered furniture will succeed in penetrating these markets. The nature of the products can only be ascertained from the markets themselves. In general, it may be said that the products must be manufactured with at least the same types of raw materials as their competitors, particularly in relation to fabric covering and resiliency as well as the other considerations of styling and comfort.

It has been suggested that one way of quickly upgrading design is to negotiate arrangements to manufacture products under licence. Such an arrangement can offer many advantages to a Hungarian factory in terms of the technical know-how and a well-developed product or product range. The same basic criteria must, however, be applied in assessing the prospects for a licensing arrangement as in analysing alternative product development strategies. These criteria should include production costs, likely sales, future competition and profit projections. At the same time, it must be stressed that the arrangement should be regarded only as a short-term expedient; it is no real substitute for soundly based and developed Hungarian design.

II. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. The industry is for the most part located in excellent buildings. Plant layout and the optimum use of all available space are an important factor in the industry, but few firms have made any systematic approach to tho question of space. Very little thought seems to have been given to cheap and simple methods of reducing handling costs. Cramped working conditions were to be found in many of the firms visited. This was in sharp contrast to the orderliness prevailing in the frame-making and corpus sectors of the factories.

2. The trend towards mechanization in the upholstery industry common in Western Europe is not evident in Hungary. Individual factories have installed some equipment, but in the main production still depends on traditional handcrafting and manual operations.

3. Production techniques are outdated, particularly in production planning, method study, design of production aids, work flow, design of work stations, materials inspection, materials handling and transport.

4. The levels of skills practised in each of the departments are generally exoellent. With increased mechanization and better over-all planning, productivity could be increased considerably.

5. Training of operatives and technicians and training in design must be brought in line with up-to-date developments in the industry.

6. The industry's choice of raw materials is very limited, and those that are available are not always the most suitable for specific requirements.

7. The industry's deficiencies are most apparent in design, the meaning and funotion of which do not appear to be fully understood. If the industry does not improve this aspect of its products, it cannot hope to expand its exports to Western Europe.

8. Organizations such as the Hungarian Standards Office and ARTEX Külkereskedelmi Vállalat, the export marketing sector for the industry, should play a more positive role in modernizing the design and the use of raw materials and methods of construction.

9. The future of the Hungarian upholstery industry, particularly in relation to exports, does not appear to lie in the use of mass-production methods, but rather in the production of furniture of above-average quality.

10. The investment required at this stage to bring the industry up to an acceptable level of productivity is small and would be no more than a fraction of that expended on the corpus sector of the industry.

11. The firms in the industry must learn to see themselves as competing with firms producing other consumer durables such as television sets, radios, washing machines, rather than simply among themselves.

12. One way to ensure that the real interests of the industry are promoted would be to have the upholstery firms directly represented on the committees of all State agencies that legislate for the industry.

13. Close liaison between the agencies responsible for quality control and standards and the factories would reduce considerably the time taken to introduce new designs or models to the market.

14. Most of the factories are large enough and have a sufficient number of trained personnel to have their own testing facilities.

Recommendations

Design

1. Design standards throughout the upholstery industry should be raised.

2. Each factory should have its own design programme easily distinguishable from that of its competitors.

3. A national upholstery design competition sponsored by the furniture industry and an exhibition of all entries should be held annually. Manufacturers should introduce more show-wood models in conjunction with home-produced leather.

4. Agreements to manufacture under licence should be regarded only as an interim solution to the problem of design.

5. Public and semi-public bodies should insist on high standards of design in the furniture they buy or the purchase of which they finance.

6. Hungarian designers should be sent on a study tour of design centres and other organizations concerned with design training in Western Europe.

Raw materials

7. Home manufacturers of basic raw materials such as fabrics, foam and springing systems should immediately improve the quality and variety of their products.

8. Manufacturers should be permitted to import materials required for modern upholstery until recommendation 7 has been implemented.

Production

9. Greater attention should be paid to work planning, layout, job analysis, production control, and materials storage and handling.

10. All fabrics should be inspected on arrival at the factory.

11. Many improvements can be made in faoric laying, marking and cutting. New sewing machines and sewing techniques in line with up-to-date sewing technology need to be introduced.

12. Most firms require buttoning and quilting machines suitable for upholstery.

13. A greater variety of cushioning systems is needed in conjunction with cushion filling and closing machines.

14. Improved upholstery assembly techniques and the use of mechanized work holders and work presses are required.

Standard specifications and quality control

15. National standard specifications for upholstered furniture should be brought in line with modern upholstery technology.

16. The present standards are unnecessarily rigid and too difficult to adhere to.

17. As part of their quality control systems, large factories should have their own performance testing equipment, which they would operate in conjunction with the Institute of Quality Control.

18. The production of new models to the market should be speeded up.

Research and development

19. The upholstery section of the Furniture Planning Institute should be strengthened to include a designer and technologist to cope with the added work load necessary for developing the upholstery industry.

20. The Institute should:

(a) Immediately produce a well-designed range of modern upholstery to the prototype stage for adoption by at least one factory;

(b) Improve the quality of its technical information service to the industry;

(c) Hold short, intensive courses on specific upholstery topics and organize study and fact-finding tours abroad for upholstery manufacturers.

Training

21. The High School of Applied Art and the furniture industry should work closely together in training furniture designers. Two places should be set aside annually at the College for students from the furniture industry which would be sponsored by the industry.

22. A new course for upholstery technician/technologist should be introduced in the appropriate College of Technology, leading to specialization in upholstery management.

23. At the same time a short, intensive course in up-to-date techniques in upholstery production should be organized for existing managers in conjunction with UNIDO.

Marketing

25. Both marketing organizations, i.e. for home and export marketing, should do much more in assisting manufacturers to evolve a rational and distinct product policy.

26. They should also pay greater attention to the techniques of marketing, such as market research, in order to advise manufacturers on the requirements of the various markets.

27. The standard of display and presentation of furniture in retail outlets should be improved.

28. The promotion of furniture should be made more effective by improving the presentation of sales literature and adopting brand names by the manufacturers.

29. Manufacturers should see themselves much more as competing with other consumer durables and less with their fellow manufacturers.

Additional recommendations concerning SZKIV

30. Greater attention should be paid to a rationalizing product policy in relation to the various factories within the Group.

31. In an organization that can arrange to have complementary activities carried on in each of its factories, the objective of planning should be to eliminate duplication of effort.

32. The following breakdown of production by factory is recommended:

SZKIV, Budapest:	Dining-room chairs, show-wood seating and contract seating, including the production of moulded furniture
SZKIV, Kecskemét:	Dining-room chairs, studio couches, convertibles, easy chairs and bedding
SZKIV, Mohács:	Dining-room chairs and high-quality deep upholstery

33. The manufacture of convertibles and bedding at Budapest should be discontinued.

34. Design, product development and prototype production should be reorganized so that all these activities will be carried out in the same location. Possibly the area to be vacated by the bedding activity in the Budapest factory would suit. At all events, both designers and engineers should have immediate access to the product development workshops, and indeed should spend more time there as well as in the factory proper.

35. Space permitting, cutting and sewing should also be carried out adjacent to the Budapest factory.

36. SZKIV should produce its own wave or zig-zag springs. There is every justification for such an investment, which would satisfy not only the immediate needs of all its factories, but could also meet the needs of other upholstery factories.

37. The factory should immediately purchase special-purpose sewing machines, cushion filling and closing machines, automatically mechanized buttoning and quilting machines, mechanized upholstery assembly devices and a shredding machine for recycling waste urethane foam.

38. Apart from the current range of dining-room chairs being produced, immediate consideration should be given to the design and production of new models, which would be the factory's own designs and not copies of other products.

39. The factory should request a UNIDO fellowship to provide training, preferably in Finland, for one of its engineers, Zsuzsanna Szita, in modern upholstery technology, with particular emphasis on the production of leather upholstery.

Annex I

DATA ON HUNGARIAN FURNITURE INDUSTRY

Total companies (number)	103
Ministerial	
Large productive companies	12
Institutes:	2
Furniture Planning Institute	
Furniture Quality Control Institute	
Belonging to the Councils	12
Co-operatives	77
Total employment (number of persons)	32,885
Corpus production	8,400
Upholstery production, including chairs	9,700
Value of production (million forints)	
1970	4,446
1975	7,981
1980 (estimated)	11,000
Type of production (%)	
Corpus	31
Upholstery	38
Productivity in 1975 (forints/person)	
Furniture average	240,000
Corpus production	295,000
Upholstery production	313,000
Exports (%)	15
To centrally planned economies	50
Market economies	50
Planned rate of growth of national income, 1975-1980 (%)	5 - 5.5

Annex II

JOB DESCRIPTION
(IS/HUN/74/007/11-01/03)

Post title:	Expert in the production of upholstered furniture
Duration:	2 months
Date required:	As soon as possible
Duty station:	Budapest with travel to Kecskemét and Mohács.
Purpose of the project:	To develop the functional and aesthetic qualities of upholstered furniture and introduce the use of modern materials and technology.
Duties:	The expert will be assigned to the Szék- és Kárpitosipari Vállalat concern in Budapest and its two factories in Kecskemét and Mohács. In particular, he will be expected to:

1. Assess the designs used at present and the upholstery technology;
2. Assess the raw materials used at present and recommend the introduction of new products better suited for the type and price range of the furniture being produced;
3. Study the technology used at present to produce upholstered furniture and recommend improvements and/or changes that will raise productivity and the quality of the finished product;
4. Introduce a quality control system for the inputs being purchased.

Qualifications:	Specialist in large serial production of upholstered furniture.
Language:	English, knowledge of German desirable
Background information:	The assistance is sought by a large concern with two factories employing a total of 900 persons and having an annual production valued at 230 million forints (about $10 million). The plants at present use wood and fibre-board frames, rubber-coconut fibre for underpadding and polyurethane foams for core padding. Flat rubber bands or metal "wave-springs" are used for backs while coil springs are used for the seats. Testing facilities exist to test the finished products, but no tests are carried out on the inputs.

Annex III

ORGANIZATIONS, FACTORIES AND SUPPLIERS CO-OPERATING WITH THE EXPERT

Organizations

Ministry of Light Industry, Budapest, II, Fő-utca 68

Furniture Design Institute, Budapest

Furniture Quality Control Institute, Budapest VIII, Rigó-utca 6-8.

Hungarian Standards Office, Postafiok 24, 1450 Budapest 9

High School of Applied Art, Budapest, Üllői-ut 29

ARTEX, Hungarian Furniture Export Marketing Company, Budapest V, Münnich F.utca 31

Butorértékesitő Vállalat, Budapest IX, Közraktár u. 32

Factories

SZKIV (upholstery, chairs) Budapest, Frangepán-u. 12-14

SZKIV, Keoskemét, Törökfái 159

SZKIV, Mohács, 1. POB 22.

BUBIV (Budapesti Butoripari Vállalat - (upholstery, chairs) Budapest IV, Lorántffy Zs. u. 15/b

Kárpitos és Dizsitő Szövetkezet (upholstery, chairs) Budapest, Rosenberg hp. u. 23

"Minőség" Kárpitos SZ, Budapest, Városszéli telep 162 u.

Kanizsa Butorgyár, Nagykanizsa, Szemere u. 4

Zala Butorgyár, Zalaegerszeg, Malom u. 2

Cardo Butorgyár, Győr, Butorgyár ut 3

Agria Butorgyár, Eger, Knézich Károly ut 36

Suppliers

Északmagyarországi Vegyiművek, Sajóbábony

Manufacturers of flexible and rigid polyurethane foams

Annex IV

GRADED PERFORMANCE TESTS FOR FURNITURE FOR SEATING: EASY CHAIRS AND SETTEES

Performance tests are graded into three categories of severity of use. The same methods of test for seat, back and arms and for the drop test are used in each grade; but the load magnitudes are increased from grade to grade for the static and impact tests and the drop heights in the drop tests, while the number of applications of a fixed load is increased from grade to grade for the fatigue tests.

The separate seat and back load tests of tests 1 and 4 (for the static loadings) may be combined to give a representative cycle of seat load on, back load on, back load off and seat load off under static conditions. Tests 2 and 5 (for the fatigue loadings on seat and back) may be similarly combined to give a representative cycle of seat and back load under fatigue conditions.

The article to be tested is submitted in turn to each of the 14 tests described below with the force and number of applications, appropriate to the grade for which it is being tested, shown in table 1 or table 2.

Moisture content and temperature of the article during testing

If the article contains items made of materials whose properties depend significantly on moisture content and it is suspected that the moisture content is unduly high, it is conditioned before testing in an atmosphere at $20^{\circ} \pm 2^{\circ}C$ and $65\% \pm 5\%$ relative humidity. Since the properties of some plastics are strongly dependent on temperature, a record of the variation in temperature and relative humidity should, if possible, be taken in the long-term fatigue tests on plastic articles. The moisture content and temperature during the other tests are recorded at the time of test.

Initial inspection

Immediately before testing, each article is thoroughly inspected. In the case of upholstered articles, as much of the cover on the bottom is removed as is necessary to allow thorough inspection of joints etc. Any apparent defect is noted, so that they will not be attributed to the test loadings.

Test 1 - seat static load test

A downwards force is applied repeatedly 10 times at a rate not exceeding 40 times a minute by means of a 200-mm diameter loading pad, faced with a 25-mm thick layer of hard polyesther foam, at right angles to the surface of the seat to any position along the fore and aft centre line of the seat likely to cause failure.

As it may not be clear which of several possible positions is most likely to cause failure, each of the positions, up to a maximum of three, may be loaded 10 times.

The seat static load magnitudes are those specified for test 1 in table 1.

Test 2 - seat fatigue load test

The test is applied as for test 1 except that the seat fatigue load magnitude and number of applications are those specified for test 2 in table 1 and the centre of the seat loading pad is 175 mm forward of the intersection point of the centre lines of the seat and back surfaces.

Test 3 - seat impact test

The seat impact load is applied by allowing a seat impact pad, weighing 25 kg and having a 200-mm diameter striking surface of leather or similar material filled with fine, dried sand, to fall freely through the heights and for the number of times specified for test 3 in table 1. The impact load is applied anywhere a person is likely to sit, at the position most likely to cause a failure up to a maximum of three positions.

Test 4 - back static load test

A load is repeatedly applied 10 times at a rate not exceeding 40 times a minute at right angles to the surface of the back by means of a rectangular loading pad, 200-mm high and 250-mm wide faced with a 25-mm layer of hard polyesther foam. The centre of the pad is at a distance above the intersection point of the centre lines of the seat and back surface equal to 230 mm for soft seats; 265 mm for medium seats; 300 mm for hard seats; or 100 mm below the top of the back, whichever is the lower, except for back rests less

than 200 mm in height, when the centre of the load pad is at the centre of such back rests. The article is prevented from moving rearwards by stops placed behind the rear feet or castors etc. During this test the seat is loaded by a constant force specified for test 1 in table 1 by means of a 200-mm diameter loading pad applied at right angles to the seat surface anywhere along the centre line of the seat but not more than 250 mm forward of the intersection of the centre lines.

The test is performed by the repeated application of the back load 10 times, at a rate not exceeding 40 times a minute of the force specified in table 1 for test 4 with the seat load in the position that just allows the front feet to lift away from the floor except at the rear of the base. If the article tends to overbalance with the seat load in its most forward position, the back load is reduced to such a magnitude as just prevents rearwards overbalancing, and the actual force is reported. The back load is not to be less than 620 N and the seat load, in its most forward position, is to be increased above the value specified in table 1 for test 1 if necessary to prevent overbalancing, and the actual force used is reported.

Test 5 - back fatigue load test

The back load in this test is applied as for test 4 except that the magnitude and number of applications of the back load are those specified for test 5 in table 1. The article is prevented from rearwards movement by floor stops behind the rear feet, castors etc.; and overbalancing is prevented by a constant seat force of 1,000 N with the centre of the seat loading pad at 175 mm forward of the intersection point of the centre lines of the seat back surfaces. If the article tends to overbalance, the back load is reduced to such a magnitude as just prevents rearwards overbalancing, and the actual force is reported. When the article is fitted with a spring rocking action base having a tension adjustment, the tension is reduced, so that the maximum possible rocking movement is obtained without causing impacts on the rocker stops. When the test is applied to a stool without a back rest or with a very low one, the backwards force is applied horizontally to the front edge of the seat.

Test 6 - back impact test

The article is placed in its normal position with its front feet prevented from moving forwards by means of stops. A weight of 6.5 kg is allowed to strike the centre of the top of the outside of the back in a forwards direction. The weight has a striking surface of 100-mm diameter, suitably padded so as not to damage the surface, and strikes the article horizontally at the speed specified for test 6 in table 1. The article is allowed to rotate freely forwards about the front feet. This is carried out 10 times at a rate of 10 times a minute.

If the article has wings, the test is repeated with the mass striking the outside of the top of the wing at right angles to its surface and in a position most likely to cause failure. If the article has a swivel base, then the direction of the impact force must pass through the vertical axis of the swivel. To prevent movement of the article across the floor, the stops may be moved to the side feet.

Test 7 - sideways arm static load test

A pair of horizontal outward loads, of the magnitude given in table 2 for the appropriate grade, is applied repeatedly 10 times by means of 100-mm-diameter load pads to any position along the insides of the uppermost part of the arms most likely to cause failure. Since it may not be clear which of several positions is most likely to cause failure, each of the positions up to a maximum of three may be loaded 10 times.

Test 8 - sideways arm fatigue load test

The test is applied as for test 7 except that the magnitude of the loads is 110 N and the number of applications is as specified in table 1 for test 8. The point of application of the load is 50 mm behind the front edge of the arm. The direction of the pair of loads is inwards if the inside arms are 655 mm or less apart, but is outwards if the inside arms are further apart.

Test 9 - sideways arm impact load test

The test is applied as for test 6 except that the impact blow is applied in an inwards direction to the outside face of the arm at any position most likely to cause a failure 10 times in each position up to a maximum of three. The article is placed in its normal position with a pair of side feet prevented from moving sideways by means of stops. If the article has a swivel base, then the direction of the impact force must pass through the vertical axis of the swivel.

Test 10 - downwards arm static load test

A vertical downwards force of the magnitude for test 10 in table 1 is applied repeatedly at a rate not exceeding 40 times a minute, 10 times to the upper surface of one arm by means of a 100-mm-diameter pad to any point along the arm most likely to cause a failure with a counterbalancing vertical force of 750 N applied to the seat if necessary to prevent overbalancing.

Test 11 - downwards arm fatigue load test

A vertical downwards force of 340 N is applied simultaneously to each arm by means of a 100-mm-diameter pad, at a rate not exceeding 40 times a minute, for the number of applications specified in table 1 for test 11 and the point of application is 50-mm behind the front edge of the arm.

Static, fatigue and impact tests for settees and similar articles

For articles intended to seat more than two persons, tests 1-6 inclusive are applied to seat units selected by the test operator in accordance with the following: if the number of seating units is not obvious from inspection, the article is to be regarded as consisting of a number of equal units, each being not more than 560 mm in width at the front and not less than 380 mm at the rear of the seat.

Tests on "seating units" of settees

Static loading

The loading is applied, in turn, to one end position and to a central position, while each of the other "seat units" supports a constant vertical

force of 750 N, except for a two-seat settee, when the central loading is not accompanied by any additional load.

Fatigue loading

Half the specified number of applications are made first to a central position and the remainder of the specified number of applications to an end position.

Impact loading

The loading is applied to an end position and to a central position.

Tests on backs

Static loading

A double back static loading is applied by means of a pair of back loading pads situated with their centres 500 mm apart with a corresponding pair of constant seat forces. For two-seat settees the double back static load is applied to positions equidistant from the centre of width. For settees with three or more positions the double back static loading is applied to two adjacent positions at one end and then to two positions equidistant from the centre of width.

Fatigue loading

Half the specified number of applications are applied to a central position, the remainder to one end position.

Impact loading

The loading is applied to an end position and to a central position and also to a wing if one exists.

Other tests

The other tests applied to arms and bases are performed as described for chairs.

Test 12 - chair drop test

For chairs: The chair is supported so that at impact on one foot the line joining that foot to the diagonally opposite foot is inclined at 10° to the horizontal, while the line joining the remaining feet is horizontal. The chair is lifted up and allowed to fall freely on a concrete floor. The height of fall is that specified for test 12 in table 2 appropriate to the grade. The chair is dropped in this way 10 times on a front leg and 10 times on a rear leg.

For settees: The settee is lifted up at one end and allowed to fall freely so that the impacting feet or castors strike a concrete floor at the same level as the non-lifted feet or castors. The heights of fall are those specified for test 12 in table 2. The settee is dropped in this way 10 times.

Test 13 - diagonal base load test

Two opposing forces of the magnitude specified for test 12 in table 2 are applied simultaneously to diagonally opposite legs or corners of the article, as near as possible to the lowest point. Application of these forces is made in an inwards direction 10 times at about 20 times a minute.

Test 14 - swivelling test

For an article with a swivel action, a vertioal downwards force of 1,000 N is applied to the seat by means of a 200-mm-diameter pad with its centre 175 mm forward of the intersection point of the centre lines of the seat and back surfaces. The seat of the article is to be rotated 45° relative to the base at 30 ± 10 cycles a minute for the number of cycles specified for test 14 in table 2.

Conditions for acceptance

The article shall not develop as a consequence of the test:

(a) Any fracture of any member or joints;

(b) Any fracture or extensive cracking through the thickness of any part of a structural shell;

(c) Any loosening, shown to be permanent by means of hand pressure applied to suitable members, of joints intended to be rigid;

(d) Any loosening of the underframe or base inserts moulded into a structural shell relative to the shell surface shown to be permanent by means of hand pressure applied to the underframe or base.

Any free movement in the back, arms or legs of the article noted in the final inspection shall not be noticeably greater than initially.

No part of the article shall develop any deformation that will adversely affect its function, nor shall any cracks develop that will spoil its appearance.

Table 1. Seat, back and arm tests: number of applications and test loading - easy chairs and settees

Test number	Test loading	Point of application	Grade of severity		
			Light duty	Medium duty	Heavy duty
	Seat				
1	Static	Anywhere	10 x 780 N	10 x 1,000 N	10 x 1,250 N
2	Fatigue	Standard	25,000 x 1,000 N	50,000 x 1,000 N	100,000 x 1,000 N
3	Impact	Anywhere	10 x 25 kg x 90 mm	10 x 25 kg x 200 mm	10 x 25 kg x 300 mm
	Back				
4	Static	Standard	10 x 620 N	10 x 780 N	10 x 1,000 N
5	Fatigue	Standard	25,000 x 400 N	50,000 x 400 N	100,000 x 400 N
6	Impact	Top of back	10 x 6.5 kg x 0.75 m/s	10 x 6.5 kg x 1.5 m/s	10 x 6.5 kg x 3.0 m/s
	Arm sideways				
	Simultaneously to each arm,				
7	Static (outwards)	Anywhere	10 x 300 N	10 x 420 N	10 x 600 N
8	Fatigue (inwards) if inside arms 655 mm or less apart, otherwise outwards	Standard	25,000 x 110 N	50,000 x 110 N	100,000 x 110 N
9	Impact	Anywhere	10 x 6.5 kg x 0.75 m/s	10 x 6.5 kg x 1.5 m/s	10 x 6.5 kg x 3.0 m/s

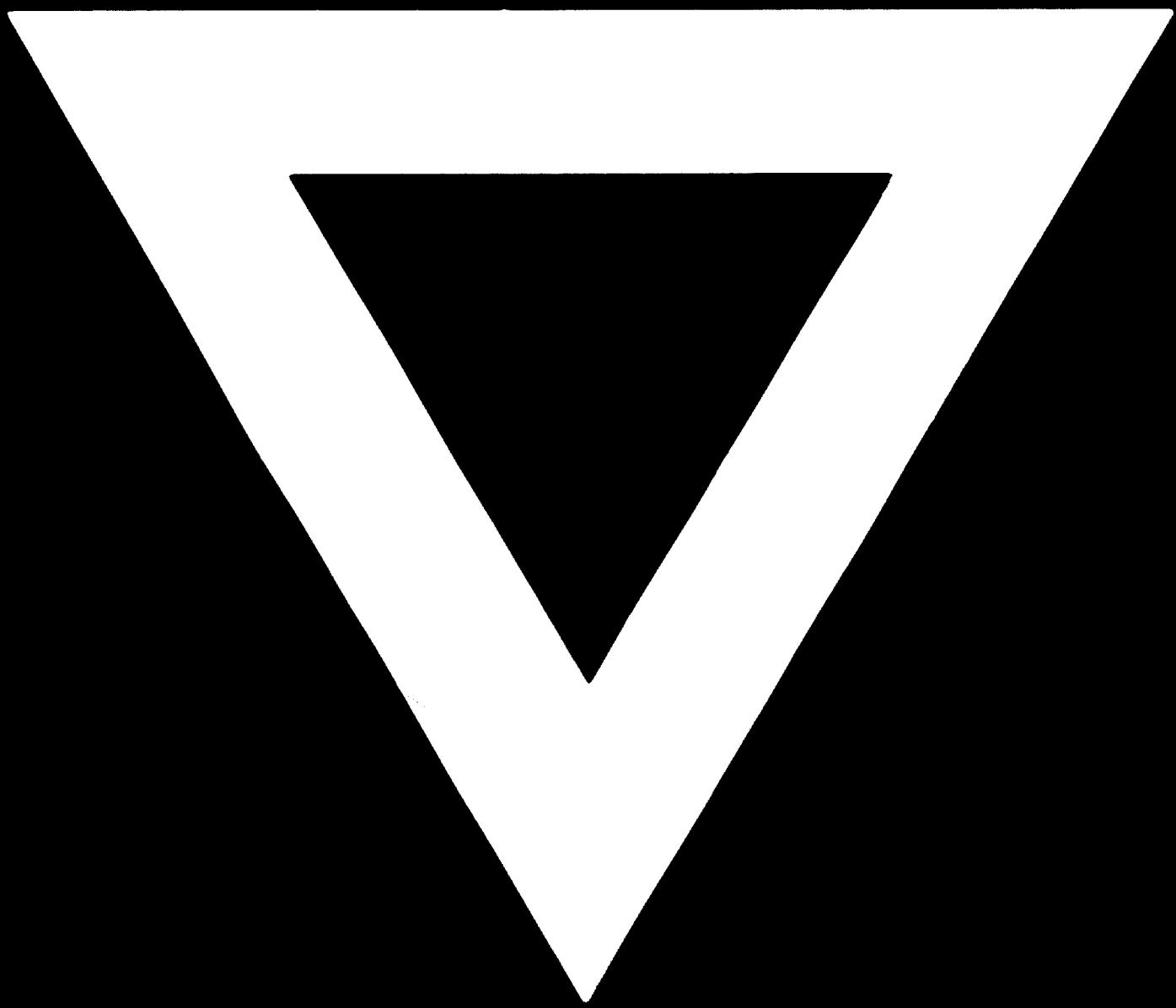
Table 2 (continued)

Test number	Test loading	Point of application	Grade of severity		
			Light duty	Medium duty	Heavy duty
	Arm downwards				
10	Static, to one arm	Anywhere	10 x 710 N	10 x 1,000 N	10 x 1,250 N
11	Fatigue, to both arms	Standard	25,000 x 340 N	50,000 x 340 N	100,000 x 340 N

Table 2. Drop and diagonal base load tests: number of applications and test loading - easy chairs and settees

Test number	Test loading	Grade of severity		
		Light duty	Medium duty	Heavy duty
	<u>Drop test</u>			
12	Rear foot	10 x 75 mm	10 x 100 mm	10 x 150 mm
	Front foot	10 x 75 mm	10 x 100 mm	10 x 150 mm
	<u>Diagonal base load</u>			
13	Static	10 x 250 N	10 x 375 N	10 x 500 N
	<u>Swivelling test</u>			
14	1,000 N downwards seat force and rotate $\pm$ 45°	25 000 times	50 000 times	100,000 times

C-272



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