The Materials and Construction of Library Furniture

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Lightness of line, strength and durability without bulk, and utility without severity have been the theme for architecture and its furnishings over the last few years. In its wake have come revised concepts in materials, in material applications, and in construction. The trend to designer-conceived interiors, and demands for imaginative, colorful, yet practical furnishings, both technical and casual, have opened a wide field of interest. This, coupled with the expanding growth and opportunity in the library furnishings field, has resulted in a refreshing competition for the library furnishings market and has stimulated expansion of research and facility improvement programs among the manufacturers.

The result of this trend may be seen in the furniture of new libraries: in the design, shape, thickness, and materials that make up table tops; in leg design and the mechanics of leg attachment; in the design, weight, material, and construction of reading chairs; in the improvement and acceptability of plastic laminates, extruded and formed plastic parts; and in the mating of fiberglass and polyester resin to give durable, colorful seating.

The objective of this paper is to provide the librarian with basic information on the materials and methods used in the manufacture of library furniture, so that he may be better able to evaluate current trends and developments.

A library table is a functional piece of furniture which must provide a working surface at a height convenient to the seated patron. This surface must be rigid, smooth, and decorative to meet today’s standards. The whole is the sum of its parts. Therefore, as we consider a table and its purpose, we study the top, its manufacture, and the nature of its support. The manner of fabrication is critical to the serviceability of the piece.

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Table top construction usually employs one of two methods: (1) solid wood (lumber) or (2) ply-construction. Solid wood construction uses solid, unmodified wood components. Ply-construction employs several layers of materials, which may be all wood, or may be a combination of wood and modified wood products, i.e., fiberboard, particle board, laminated plastics, etc.

Solid wood tops are made of lumber strips or boards edge-glued under pressure, to form a panel. When the glue is set, the panel is surfaced in a planer, cut to size, and sanded to a uniform, smooth surface. If the component strips are narrower than they are deep, i.e., narrower than the thickness of the table top, the panel is often referred to as of “butcher block” construction. If the dimensions are reversed, it is simply a solid wood panel or top. This method of construction is sometimes used for the tops of charging desks and for catalog reference table tops which are subject to abrasive wear of books or the bottoms of catalog card trays.

Wood, by nature, picks up and gives off moisture proportionate to the relative humidity of its environment. In doing this, wood shrinks or swells. In the case of a solid wood panel, the whole panel expands or contracts as an expression of the movement of each of the component strips. Although each strip has its own individual grain pattern and reacts differently to moisture, these differences are minimized by proper kiln drying, machining, and gluing methods. The inevitable small differences are, for the most part, submerged in the panel as a unit. Because movement is inevitable, a solid top must be flexibly mounted, allowing it to ride with dimensional changes in the wood. Any effort to tie it down rigidly can result in splitting of the top, or in the distortion of the top and any framework to which it is attached. A solid top, particularly one of large components, must be well made to hold up over the years. Today’s use of solid tops in libraries is primarily a matter of design, since, with the possible exception of tops for charging desks and catalog tray consultation tables, there is no use to which library furniture is subjected that requires this construction—that is, in the same sense that dictates solid wood tops for work benches.

Ply-construction, as indicated earlier, is used in multiple combinations. By definition, the term implies the use of three or more plies or layers of materials face-glued together to make up the full thickness of the panel or top. In all cases, the panel should be balanced, i.e., it should have an equal number of plies on each side of the center.
ply or core. With such construction there will always be an odd number of plies or layers. A given ply-construction has specific merits, and its components, depending upon the type, have definite purposes. These will be pointed out as we discuss the basic types.

Lumber core, ply-construction employs a core, or center ply, of solid lumber strips made up in the same manner as a conventional solid panel or top. The core materials, however, should be low density, straight grained wood species, such as basswood, or yellow poplar. On each face of the core, normally with the grain direction at right angles to that of the core, are the "cross-band" veneers. Firmly glued and with the grain so oriented, the cross bands restrain and thereby minimize the movement of the core, as it naturally seeks to respond to atmospheric moisture changes. The "face" and "back" veneers are, in turn, face glued to the cross-band veneers. The grain directions are normally at right angles to that of the cross bands and in the same direction as that of the core.

Here then, we have an all wood top that has its several elements oriented to restrain the major movements of the core, and balanced to restrain it equally on each side and thus avoid distortion. Over an extended period, even when subjected to extreme moisture changes, a well made ply-construction table top will not fail because of fatigue. In addition to the physical advantages of balanced, lumber core construction, this method has the advantage of permitting the use of decorative face veneers with wider grain patterns and, consequently, more pleasing wood figures.

It is worth mentioning that there is a form of lumber core construction employing wood blocks, rather than full-length strips, for the core components. This is common practice in the fabrication of commercial exterior door panels. However, since it is very difficult to produce a permanently attractive and satisfactory top surface using block construction, the method is not suitable for use in library tables. The difficulty arises from the fact that each piece of wood has its own movement pattern, and only if block components are uniformly kiln dried and securely bonded end-to-end and edge-to-edge will the core move as a unit. Movements of the individual blocks show up through the face veneers as outlines of the separate pieces, a condition usually referred to as "telegraphing."

Lumber core construction is traditionally and properly considered the best all-around manner of making library table tops. Properly made, such construction is stable, has good screw holding capacity,
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permits machining and edging or banding, has good tensile strength and stiffness, and is not subject to splitting through fatigue or abuse.

Veneer core construction, as implied, is that in which the full thickness is made up of wood veneers glued face to face. The grain directions of adjacent plies are at right angles. A familiar example of this type of construction is a decorative wood veneer laid up on a sheet of douglas fir plywood. The same method, using hardwood veneers throughout, is used in producing panels and tops for household furniture. When all hardwood veneers are used, this is a quality construction, employed successfully with decorative wood veneer faces, and as an underlayment for decorative high pressure laminates.

Particle board (a term employed here to cover all types of wood flake, fines, and splinter boards) is made by mixing wood particles with glue and subjecting the mixture to high heat and pressure. This material is gaining increased acceptance as the industry improves the quality control of its products. The subject of particle board is an important one. For this writing, suffice it to say that there are many types of particle board, determined by the form and combination of wood elements employed and by the method of manufacture.

A good quality board, properly used, makes an excellent panel or top for many purposes. It has not, however, found any widespread use in the manufacture of quality library furniture and cannot be generally recommended for large tops or for structural or load bearing members until it has been improved by further research. As of the present time, particle board has been used largely for certain types of library work room furniture and for shelves in wood installations. In the latter use, it has been found to warp under loading and should not be used for this purpose.

Table tops for library use run the gamut, from small study tables for single occupancy, to large tables for general reading and conference purposes. Requirements for each type differ, based on the use and abuse to which the table may be subjected.

The strength and durability of a table top depends upon its construction. We have discussed the major types. The appearance of a top and its use as a working surface is, for the most part, a matter of the surface material and the finish. There are two major top materials: wood, either solid or veneer, and high-pressure, plastic laminates.

Wood, which is unchallenged as the material most easily and gracefully lived with, both in the home and in the library, has been the traditional material for library table tops. However, the advent of
high-pressure, plastic laminates brought a competitor, particularly in those instances where there is a need for a hard, stain-free surface.

Vast improvements in these materials, in quality, uniformity, and selection of patterns, have come in recent years and have paved the way for the laminates to take an increasing share of the market for top surface treatment. To counter the recognized advantages of plastics, yet keep the traditional values of wood, the wood finishing industry has developed both new film overlays for low pressure application on wood veneered panels, and durable catalyzed synthetic finishing materials, including the polyesters, epoxies, and polyurethanes, for spray application. These materials rival the plastics in stain and abrasion resistance. For the most part, however, these finishes are in their infancy, and because of their present high cost and difficulty of application have not found wide use in the production of library furniture.

For general finishing, most manufacturers continue to rely upon the traditional nitrocellulose lacquers applied either hot or cold. These are extremely versatile, relatively inexpensive, clear, easily maintained and repaired finishes. However, library furniture manufacturers are making increased use of the conversion varnishes (catalyzed alkyd-urea resin solutions) sometimes referred to as catalytic varnishes. Properly formulated, these synthetics are definitely superior in solvent and abrasion resistance to the conventional lacquer finishes.

It should be noted that not all finishes of the same type are equally good. Thus, one manufacturer's conversion varnish may give better (or poorer) performance than another's, depending upon the formulation and upon the way in which the material is applied. Since the most satisfactory method of evaluating finish performance is by laboratory testing, the methods outlined in Appendix I, which have been successfully used in many instances, may be useful.

Of interest because of their present vogue are the oil finishes. These are penetrating rather than film finishes, as are the lacquers, varnishes, etc. They are most pleasing when used with hardwoods such as walnut and teak, and are most practical for furniture in casual and low traffic areas. Softness, low sheen, and easy maintenance are special characteristics favoring the oil finishes.

Both wood veneer faces and plastic laminates can be made burn-resistant by inserting an aluminum foil laminate directly beneath the face element. The foil serves as a heat dissipator, and saves loss from the careless cigarette. Fabrication with inserted foil laminates is very
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exact and expensive. It is justifiable only for table tops in areas where smoking is permitted or hot elements are used.

A support-free panel would be the ideal, and almost every contemporary designer works toward this end, making every effort to give firm, unyielding support to the table top, yet trying for the effect of a top with minimum support. Answers have come in the form of slim line center pedestals and in the slim line metal leg bases, but primarily in the use of plate mounted legs, individually attached to the underside of the top. The latter obviates the need for complete base construction, and has made it possible to eliminate the apron which, in earlier designs, was required for the solid attachment of the legs.

To make a table with four separately attached legs as stable as the traditional solid design of top on a full base calls for good materials and good engineering. Three elements are involved: the top, the legs, and the tie-in between the two, the mounting plate. All three must be rigid if the whole construction is to be so. Since the legs are mounted to the top, the top must be strong and rigid. The legs themselves must not flex. Whether the legs are laminated or solid is not material to this, assuming proper lamination. The steel plate used for mounting the leg to the top is normally at least \( \frac{1}{4} \) inch in thickness and seldom less than 4 or 5 inches square. Usually the leg is bolted to the plate. A hanger bolt screwed into the leg and then threaded into the plate, although occasionally used, is the least effective method. The best type of library furniture construction uses a bolt through the mounting plate inserted into a boring in the top of the leg and then threaded into a cross-inserted steel pin or bushing. In this system, the wood is bypassed in developing strength, by tightening the leg to the plate. This system is very effective.

The plate, in turn, may be screwed to the underside of the top with wood screws, or, in better construction, with bolts that are received by steel bushings or pins inserted into the panel from the edge and parallel to the surface of the top. Using bolts and pins, the wood is again bypassed in tightening the joint. The advantage in the latter system is that in the metal to metal joint there is less concern for fatigue caused by the many cycles of racking and twisting to which library tables are inevitably subjected.

A discussion of table construction, no matter how brief, is incomplete without mention of bridging. A table top spans the distance between leg supports. When individual legs are used without benefit of stretchers or aprons, there comes a point when the natural stiffness of
the top must be supplemented by using a bridge or keel. As a general rule, the wider the span, the heavier and deeper the bridge member or keel. When table lengths exceed a certain point, it is usually more practical to use a center supporting leg than to go overboard in bridge construction.

A sharp edge is easily damaged, and in turn, can inflict damage if struck by the user. For these practical reasons, and for purposes of design, table tops are usually edged. A solid lumber top can be given an edge of any shape without supplementary edging material, but ply-construction using lumber or veneer core, normally needs an edge banding to protect the elements of the construction. Exceptions, of course, are found where the edges are tapered back and under or, in the case of wood core, are given a shape that allows the core to project beyond the face element so that any impact is absorbed by it, rather than by the more fragile veneers or plastics. Edge bandings may be wood, veneer, wood strips, densified wood, plastic, or metal. For most applications, wood edging is more elegant and imparts more warmth.

In discussing table tops, we have briefly covered general construction methods, core materials, finishes, and edgings. The points made here hold true for all types of panels, although most panels are not judged as harshly or are so demandingly used as table tops. Where the term “panel” is used, it applies to the full range of furniture components, including the backs, sides, tops, and bottoms of card catalog cases, book truck panels and shelves, magazine rack sides, wood book shelving, and similar items.

The library chair used at a table for reading or writing presents the greatest challenge to the furniture manufacturer in that it must be strong, rigid, resistant to abuse, and—most important of all—comfortable. At the same time, it must be reasonably light in weight for ease of handling.

The conventional, easily tipped, straight-back chair with its scooped seat, slats, straight posts, and straight top back rail has been largely replaced by so-called “wall-saver” designs. Here the back posts are curved, allowing the lower or leg portion of the posts to strike the floor molding, thus preventing the back posts from hitting the wall.

Equally important in the above construction is its “no-tip” feature. Tipping is so difficult in such designs that the user is discouraged from doing so. This adds immeasurably to the life of the chair. The back posts can be curved by band-sawing a solid or laminated block, or by steam-bending a straight post, and cutting to pattern after bending.
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Both methods are practical and normally perform well. However, the steam-bent post can boast continuous grain throughout its length and for this reason it is less liable to breakage or splitting than is sometimes the case with band-sawn posts.

Wall-saver designs, although less susceptible to tipping by the occupant, must nevertheless be strong enough to resist the tremendous strains put on them if so abused. When tipped backward, the major stresses on the chair occur at the points where the side stretchers join the back posts; when tipped forward, at the stretcher to leg joints. For these reasons, machining of these joints must be accurately done to assure a tight fit. Assembly calls for a strong adhesive, adequate doweling (at least two dowels per joint), and the support of well-fitted, glued and screwed corner blocks bridging each joint.

Bottom stretchers and rungs make table chairs stronger, but their use is often in conflict with contemporary design and its need for uncluttered simplicity.

Some recent designs in wood table chairs use straight back posts positioned at an angle to the floor. Although the wall-saver feature is still present in this design, as is the resistance to tipping, the seat does not extend to the back posts, thereby giving the floating seat appearance so desirable in some contemporary designs.

Molded plywood and molded reinforced fiberglass seating have also gained acceptance for library use. Properly made, such seating is useful, attractive, and normally light in weight. Each type has been extensively used for stacking chairs. The compound curve construction of these designs explains why both great strength and low weight are possible. The weakness of this design is usually in the attachment of the legs, although this has been largely resolved by the use of a rubber grommet coupling.

Molded plastic chair shells are made either by intrusion molding or by forming with fiberglass and polyester resin; the same basic procedure and materials used in making boat hulls. Of the two systems, the latter is that referred to as reinforced fiberglass. Those chairs longest in use and of highest reputation are of this construction. Color is an important factor when using plastics. In such application, however, coloring must be integral and not merely a surface treatment.

As in other products of complex manufacture, furniture is best judged by the expert. Experts, however, are not always at hand, and librarians, although otherwise trained and experienced, are often called upon to specify, evaluate, and purchase furniture.
The criteria in Appendix II will be helpful to the librarian called upon to judge the general quality of library furniture. Such criteria, however, cannot substitute for proper specifications, the development of which is a job for an expert in wood furniture design and construction. The performance of wood finishes is more readily evaluated and for this purpose, the tests found in Appendix I will prove helpful.

APPENDIX I

PERFORMANCE TESTS FOR THE GLUING AND FINISHING OF WOOD FURNITURE

Tests which determine actual performance are highly desirable as a means of evaluating the durability and general quality of library wood furniture. Such tests are exceedingly difficult to develop, however, and as a consequence, relatively little work has been done in this area.

A few years ago, the Library Technology Project of the American Library Association instituted a study to develop a satisfactory performance test for library reading chairs made of wood. The result of this work, which was conducted by the Department of Engineering Research, North Carolina State College at Raleigh, was a procedure by which the strength of various types of chair construction could be evaluated. The method, unfortunately, is difficult to apply because of the size of the equipment required, but it does form the basis for further work that might well be carried on by the LTP to provide chair endurance standards acceptable to the industry and to librarians alike.

Despite the lack of suitable methods for testing durability and general quality of construction, there are methods for testing the finishes used on wood furniture and one accepted test for evaluating the quality of glue and the methods used in the fabrication of wood panels and table tops. These tests, which are not new, have been widely used for the purchase of institutional furniture. They have also been used in the purchase of library furniture but are not as well known as they should be. Incorporated into wood furniture specifications, these tests can help library purchasers obtain finishes with the beauty, durability, and resistance to abuse required for library furniture.

It should be realized, of course, that it is not enough to write these tests into the specifications. Nor is it enough to ask prospective bidders
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to certify that their finishes meet these specifications. Samples of the finish to be furnished by the bidder should be submitted to the purchaser who should, in turn, see that they are tested and the results certified to him by a qualified independent testing laboratory. Assuming compliance by bidders with all other aspects of the bid documents, the award can be based on the results of the laboratory evaluation. While these tests are incomplete, as regards all the performance characteristics of wood furniture, they are sufficiently rigorous to ensure the elimination of cheaper grades of furniture.

Most large cities have one or more qualified testing laboratories which may be located through the yellow pages of the telephone directory. In some cases, the city purchasing agent will have knowledge of such laboratories. Lacking other sources of information, the librarian may write to the Library Technology Project of the American Library Association for a list of testing laboratories in his area.

The cost of these tests, which must be borne by the purchaser, will be approximately one hundred twenty-five dollars per set, although charges vary somewhat from one laboratory to another. Testing costs, however, are negligible when compared with their effectiveness in eliminating poorly finished furniture.

Although these tests are in general use, variations are used by different laboratories. Usually, however, it will be better to insist that the methods cited here be used. In any case, the laboratory requested to conduct such tests should be identified and the tests discussed with the personnel who are to run them, before the specifications are completed.

In the event of non-award of a bid because of failure to pass these tests, the unsuccessful bidder should receive a copy of the certified report on his product submitted by the testing laboratory.

Samples required for these tests will vary somewhat with the number of panels to be tested for delamination. The sizes given here are those usually preferred for such tests, although this point should be checked with the laboratory conducting the tests.

Samples for testing delamination (where applicable to the specifications concerned) include:

1. Two unfinished test panels, each 6 inches by 6 inches, fully representative of the five-ply, lumber-core construction (or solid, edge-glued construction) to be used in the table tops furnished in response to the specifications.
2. Two unfinished test panels, each 6 inches by 6 inches, fully representative of the five-ply, lumber-core construction (and/or solid, edge-glued construction) to be used in the shelving or other panels to be furnished in response to the specifications.

3. Two unfinished test panels, each 6 inches by 6 inches, fully representative of the plywood veneers to be furnished in response to these specifications.

Samples for testing finish include twelve test panels, finished in complete accordance with the specifications, each 6 inches by 12 inches, plywood veneer construction. Samples should be of the same wood veneer specified, and should be similar in color to that required in the specifications.

PERFORMANCE TESTS FOR WOOD FURNITURE
(DELAMINATION AND FINISH)

Test No. 1. Cold Soak Test (Delamination)—This test should be conducted in accordance with procedures established and approved by the Commodity Standard Division of the General Services Administration, Test CS-35-49. Samples, (In writing specifications, a description of the exact sample or samples to be tested should be included here.) fully representative of the materials to be used in the tables furnished on this contract, shall be submerged in water at room temperature for four hours, then dried at temperatures of 70 to 100 degrees F. for twenty hours. After fifteen such cycles, no delamination shall be apparent. Failure to meet this requirement shall be cause of disqualification.

Test No. 2. Hot and Cold Check Test (Finish)—A sample of finished wood shall undergo ten cycles without evidence of checking or finish failure. Each cycle shall consist of exposure for one hour to a temperature of 120 degrees F., one hour at room temperature, one hour at -10 degrees F., and one hour at room temperature. Specimens for this test shall have aged not less than five days after completion of finishing.

Test No. 3. Resistance to Stains (Finish)—The test panel shall be exposed to the following materials:

A. Lipstick—as manufactured by Revlon under the name “Lanolite.”
B. Permanent writing ink—as manufactured by the Parker Pen Company, under the name “Permanent Black.”
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C. Carbon paper—as manufactured by Carter under the trade-mark “Midnight.”
D. Coca-Cola.
E. Reclaimed rubber such as used in rubber heels.
F. Rubber stamp pad ink—as manufactured by Sanford under the name “Sanford Opaque.”
G. De-natured alcohol.
H. Acetone.

Liquid agents are to be applied one-half teaspoon directly to the surface, while solid agents, such as carbon paper and lipstick, are to be rubbed on the surface. All should be allowed to stand four hours, after which the surfaces are to be washed with distilled water, followed with lacquer thinner. Any change in the appearance of the finish following this final treatment shall be deemed a failure.

Test No. 4. Resistance to Fading (Finish)—Specimen of finished wood shall have one-half of the surface suitably masked and then exposed to two General Electric 275 watt R.S. sunlamps for sixteen hours. Specimen is to be placed 24 inches from the lamp, and temperature of sample is not to exceed 100 degrees F. At the end of the test, any appreciable difference between the masked and unmasked portions of the specimen shall be considered failure and cause for disqualification. Color of the sample must match as closely as possible that submitted by the owner.

Test No. 5. Resistance to Heat (Finish)—A specimen of finished wood shall tolerate a well-lighted cigarette laid flat on the surface with the burning end in actual contact with the finish for a period of 30 seconds, without permanent damage. Inability of the finish to meet this minimum requirement shall be considered a failure.

Test No. 6. Resistance to Scratching (Finish)—Using method 6303 of Federal Test Method Standard No. 141, with an applied maximum load on the Hoffman Scratch Tester, but with only one stroke of the scratch tool across the surface, the finish must not be completely removed at the completion of this stroke.

Test No. 7. Resistance to Printing (Finish)—Using method 6211 of Federal Test Method Standard No. 141, a specimen of finished wood shall be subjected to a weight of not less than two pounds per square inch at 110 degrees F., applied over a surface 8 inches square covered with 00440B, Type III, cheesecloth, for 24 hours. Any evidence of printing shall be considered failure.
Test No. 8. **Resistance to Humidity (Finish)**—The finish shall withstand 100 per cent relative humidity and 110 degrees F. for a period of 72 hours, without any permanent discoloration or softening of the varnish film.

Test No. 9. **Resistance to Hot Water (Finish)**—Twenty-five cc. of boiling water shall be poured on the finished surface and allowed to cool to room temperature. The water shall then be wiped from the surface and the finish examined for spotting, blushing, or softening. Any evidence of these conditions shall be considered failure.

Test No. 10. **Resistance to Cleaning Compounds (Finish)**—A 5 per cent solution of trisodium phosphate shall remain in contact with the finished surface for a period of twelve hours and shall cause no permanent discoloration or softening of the film.

Test No. 11. **Resistance to Normal Wear and Abrasion**—This test is to be conducted in accordance with the following procedure: A wood block with rounded edges, approximately 4 inches by 6 inches, faced with 1.05-54 sateen and loaded with a total weight of 10 lbs., plus or minus ½ pound, shall be moved reciprocally across the surface of the sample. The pad shall be saturated with Dutch Cleanser paste (20 grams of Dutch Cleanser in one ounce, liquid measure, tap water). Rewet with paste every fifty reciprocations. The finish shall withstand at least 100 motions in each direction without being worn through to the wood.

**APPENDIX II**

**General Criteria for Evaluating Library Wood Furniture**

In the space available here, it is possible to provide only a partial list of the criteria used by an expert in judging the quality of library furniture. Further, these criteria, depending as they do largely upon visible characteristics, cannot be fully indicative of the durability of the construction or the quality of the finish. Nevertheless, close attention to such details will help the untrained person to be a better judge of library furniture, whether it be in the showroom, in an exhibit, or in a library installation. Librarians with some experience in the purchase of library furniture are already familiar with many of these principles.

**General Criteria**

Stability—Subject the piece to normal use or occupancy. Shifting the weight several times will enable the user to determine if the joints

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are strong and if the elements of the piece are individually and collectively rigid.

Finish—The quality of the finish depends upon the preparation of the wood by sanding, as well as upon the finishing materials and their method of application. An experienced furniture man can judge quality with his hands, by the smoothness of the exposed edges and, more important, by the unexposed edges which are, nevertheless, subject to contact by hand or leg, i.e., by the smoothness of the undersides of the top, the aprons, stretchers, rungs, and similar parts. Smoothness of the unexposed parts normally indicates the quality climate surrounding the manufacture of the piece.

In judging furniture for library use, the finish need not be of the same quality as a piece of fine living room furniture which has been hand-rubbed many times. In all cases, however, the film thickness must be substantial and continuous. The unexposed surfaces should have a good finish, even if not of the same quality as used in the exposed areas. The back and the undersides of all panels and tops should have at least a coat of sealer.

The above follows the rule of furniture economics. Sanding and finishing are the most expensive operations in the plant. Unless required by the quality standards of the manufacturer or by the trade he solicits, these operations are not extended beyond the minimum. Keep in mind, therefore, that a reasonably well-constructed piece of furniture may not have a high quality sanding and finishing job, but rare indeed is the piece of well-sanded and finished furniture that is not of real quality in both material and manufacture.

Specific Criteria

Check chairs for:

1. Comfort—the chair should support the user's legs and back when the chair is in position of normal use; height of chair arms—arms should not be too low or too high to be comfortable; contour of seat—some depression in the center makes chairs more comfortable; slope of seat from front to back—an excessive slope tilts body away from the surface of the table and is uncomfortable for writing or for reading with the book on the top of the table.

2. Strength—there should be no flex or wobble of any joints. The best construction uses a minimum of two dowels where seat rails join back posts.
3. *Finish*—feel arm rests, seat edges, and stretchers.
4. *Joints*—should be tight and well fitted.

Check tables for:

1. *Stability*—stand at one end and lean, exerting forward and downward pressure; table should neither tip nor rock. (Adjustable glides should be furnished.)
2. *Top construction*—judge for proper support and top thickness by having someone sit on the table near the center. Deflection should not exceed ¼ inch in 6 feet. No permanent deflection should be observed. Larger tables, depending upon design, may require a keel for rigidity. Poor construction can frequently be detected by the interior elements telegraphing through face veneers. Throw a beam of light across the table surface at a low angle. Poorly dried interior elements and joints will stand out in relief.
3. *Leg attachment*—turn table on side and attempt to move leg. No motion of leg at point of attachment and no flexing normally indicates good construction.

Check card catalog cabinets for:

1. *Proper fit of drawers*—they should slide readily but not be loose. Interchange several drawers—the degree of fit should be the same. Drawer runners are of solid hardwood in good construction; beware of plywood runners.
2. *Joint construction*—wide, close fitting dovetails should be used in attaching drawer sides to tray fronts. Attachment of tray backs to sides may be by dovetails or box joints, although the locking characteristic of the dovetail favors its use. Small glue blocks in the back corners add strength and help to protect the tray against damage when dropped.
3. *Hardware*—check tray pulls for rough surfaces or sharp edges. Try card compression mechanism for ease of motion.
4. *Sliding reference shelves*—shelves should slide easily, but not be a loose fit. Examine stops for sturdiness; light wood screws soon pull out or break.

Check case goods generally for:

1. *Joints*—should be tight, well fitted.
2. *Moving parts*—drawers, doors, pull-out slides, all should be smooth running and well-fitted.