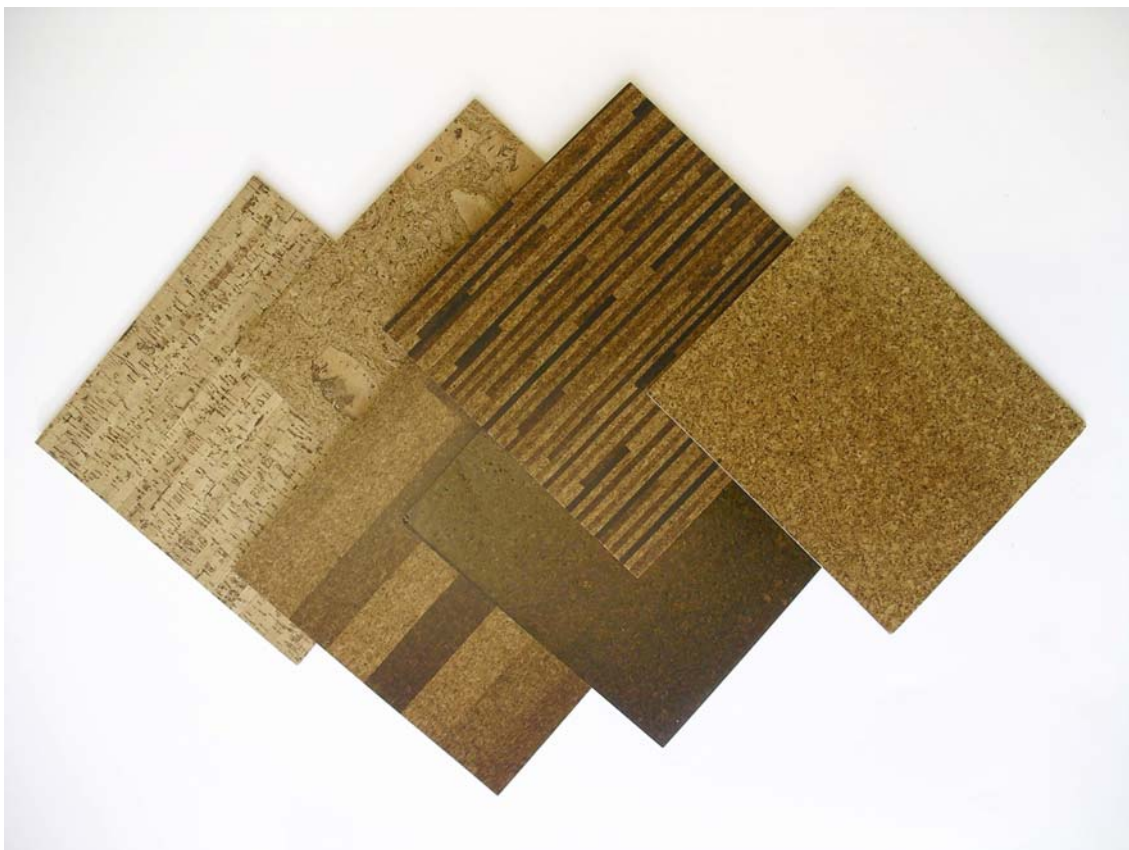


Library Interior Finish Materials



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1. FINISHES SELECTION PROCESS

1.1 Scope – Who, When, What, How

Responsibilities

Selection of the interior finishes is a process incorporating the efforts of the Design Team (Interior Design Professional and Architect) and the Library/Owner Representation. In addition, input will most likely be required from the building cost estimator and the lighting consultant. Together they all make up the Library Building Team.

The Interior Design Professional

The interior design professional, who has experience in significant commercial projects, should take the lead and guide the task of choosing materials, finishes, and colors for the interior. Since there are specific issues of durability, longevity, and public use associated with the interiors of libraries, it is preferable that the interior designer be licensed and have specific knowledge of this building type. In California, the CCIDC (California Council for Interior Design Certification) administers registration under the testing procedures of the NCIDQ (National Council for Interior Design Qualification).

The interior designer starts by gathering information from the architect regarding the design concepts and aesthetic intent as well as functional building systems and locations of any preliminary finish selections. Likewise, information should be obtained from the Library/Owner Representation, including information regarding general user profiles.

The role of the interior designer is to be the design team guide through the process, taking the lead, yet listening and providing separate options for feedback. Initially there may be two or even three separate design directions presented. This should be narrowed until one remains for detailed development. Good designers are forthcoming in product knowledge, mindful of both practical and aesthetic issues, inclusive in the design process, and responsive to differing aesthetic opinions with a mature attitude.

The Library/Owner Representation

While there are variations from project to project, the members of the library/owner representation often include key library and facilities staff, community user representatives, city, county or state representatives, and possibly a construction management firm and the library programmer. A steering committee should be formed comprised of individuals who are interested in serving for the duration of the project.

It is the responsibility of this group to attend presentations and give input and direction to the interior designer. Input should be focused on function and maintainability of the finishes rather than personal taste. For example, it is appropriate to express that stone or hard-surface flooring

will hold up better as the flooring material for the entrance lobby or major stairs as opposed to carpet, or to express concern that a carpet may be too dark or too light overall, rather than a preference for blue or a dislike for green.

These representatives should keep their constituents informed, and bring up legitimate concerns that arise. However, since work progresses on the basis of decisions made, they should also uphold past decisions, and not reopen closed issues. This means that members of this group must feel equipped with sufficient knowledge to make those decisions along the way. They must feel free to ask questions and confident they will receive a response from the designer that addresses the issue directly.

The Architect

At the start of the interior finishes selection, the architect should communicate the building design intent, provide samples of exterior finish materials and palette to the interior designer, and coordinate the meetings and schedule of work. The architect and interior designer will meet to review preliminary work before involving the library/owner representation so that they, the design professionals, present clear coordinated aesthetic directions. It is preferred that the architect and the interior designer be in the same firm, for improved coordination and single point responsibility. The architect is ultimately responsible for the production and coordination of the building construction documents for all consultants.

The Schedule

The program, usually authored by a professional library programmer, is the road map for the entire project and a reference checkpoint to ensure that the users' needs are always kept in mind. The consecutive phases of work that follow are Schematic Design, Design Development, Contract Documents, Bidding/Pricing, and Contract Administration. It is a process whereby the decisions made in previous phases become the basis for development and progressive refinement. Library representatives will provide feedback at appropriate times, with formal review and approval periods at the end of each phase.

Schematic Design Phase

With information communicated in the program, the architect will begin setting preliminary finish concepts and allocation of materials. Initial team meetings will be held where the design team will develop not only the functional needs of the space but also the aesthetics that support the main design concept, or "story" of the space. The architect takes the lead in helping to establish a budget proposal together with either a cost estimator or a contractor.

On the drawings, the architect or the interior designer will identify appropriate types of materials for the large surfaces of floor and ceiling. Areas of floor finishes are marked on the floor plan,

and likewise ceiling finishes are marked on a reflected ceiling plan. (Note: a *reflected ceiling plan* is a drawing of how the ceiling would appear if the floor were a large mirror.) Library representatives should review these carefully, especially from the operations and maintenance perspectives.

At this point in the process, it is too early to consider visual appearance. Instead, it is important to identify what type of material is to be used. Common flooring materials are carpet, stone, resilient flooring, ceramic tile, and wood. Some common materials for the ceiling are acoustic tile, glass-fiber reinforced gypsum board, and wood slat. In a library, the wall finishes are not as predominant since the spaces are fairly open. As a result, there are relatively less wall surfaces compared to a floor and a ceiling. In addition, freestanding stacks often hide the walls from view and many walls themselves will be covered with shelving. Common wall materials are painted gypsum board, wood veneer, and vinyl or fabric wall coverings.

The cost estimator or the contractor will provide the quantities (called material “take-offs”), unit costs, and summaries based on the floor and ceiling drawings and the discussions about the wall materials. Experience counts, so this effort will be more accurate when the design team has some library design and construction experience. An 8% to 10% contingency should be held due to the lack of detail at this phase, as well as a contingency for possible cost escalation.

Design Development Phase

Once the types of materials have been essentially determined in the Schematic Design Phase, actual product selection can begin. The goal of the Design Development Phase is to have those product selections made, including color and all other aesthetic attributes. Interior designers will draw inspiration from many sources. Some of these will be the palette of the architect’s exterior building materials, the context of the site, and natural lighting conditions. If there are any particularly interesting aspects of the collections themselves, or cultural identity in the community, these too can give direction.

The interior designer should coordinate first with the architect, and then present up to three finish palette options for the Library’s review. While these palettes are only concepts and therefore not fully developed, they should be complete enough to communicate basic finish materials, color direction, and a feeling for the interior environment. Often materials shown will include stone, carpet, wood, plastic laminates, fabric, stack end finishes, and accent paints. Should any of these initial concepts be rejected, the designer will need to understand the reasons why and be prepared to present alternative schemes. On the other hand, the Library representatives should try to refrain from making judgments based on personal aesthetic preferences; rather, decisions should be based on functional or operational requirements.

Design schemes are commonly presented in loose form with samples, sketches, and catalog cuts during the Design Development Phase. In the initial presentation, some of the materials shown may not be realistic; e.g., they may not be durable enough or they may not meet the budget. But

they will communicate design intent. Obviously, it is the final responsibility of the designer to show materials that are practical, maintainable, and are affordable within the project budget as the work develops. Depending on how easily consensus is reached by the Library Building Team, as well as the size and complexity of the building, there may be several rounds of presentations until the design direction is determined. Similar to the building phases, each turn is progressively more refined and more comprehensive, based on decisions made in previous meetings.

At the end of the phase, essentially all finish selections should be made and documented in outline form by the interior designer. Record boards of the approved selections will be made and often the Library's representative will request a set of formal presentation-quality boards for posting to keep the public informed and help in the fund-raising effort. Another cost estimate is completed at the end of this phase.

Contract Documents Phase

During this phase, the final development and documentation of the approved finish palette and locations will occur. This is the critical phase for the architect and interior designer to coordinate and detail all aspects of the project, including final product research and material transition detailing. The end product is a set of drawings and specifications describing all the finish selections and locations so that contractors can price and build.

Within the drawings and specifications, information about finishes is communicated on the plans, elevations, room finish schedules, and legend. Added to this effort is the *bidding* situation that is usually required on government-funded projects, in which *sole sourcing* is not allowed (a *sole source* is a single supplier who provides a price without competing bids). To protect the quality of the finishes during a competitive bidding process, the designer will usually specify and document using a *performance standard* for products and installation. The Library representatives will not need to provide as much information as this phase progresses and as finish selections are finalized; the task then becomes one of documenting for construction.

For further information on bidding and specification methods see: Specification and Bidding at www.librisdesign.org.

2. FLOOR FINISHES

Floor finishes are the single most important interior finish material to be selected since the floor is the largest surface in the library and subject to excessive wear from large numbers of patron visits. Therefore, it is important to focus on the performance characteristics of floor finishes first and then the aesthetics later. Common materials for flooring include carpet, stone, ceramic tile, wood and resilient flooring such as vinyl tile, linoleum, and cork.

Keep in mind that accessibility codes limit the height variation of adjacent flooring materials to a half-inch, which is an important consideration at door thresholds and where floor materials change from one type to another.

2.1 Carpet

There are many positive attributes that make carpet, both broadloom goods and carpet tiles, the most widely used material for the majority of library floor areas. It has good acoustic properties, can be reasonably maintained, is relatively inexpensive, and offers abundant aesthetic opportunities. A well-chosen carpet can easily last up to 15 years before replacement is required if it is properly maintained. Appropriate carpets tend to be very dense, have at least 50% loop pile yarns, are not too light in color, and not too solid in appearance.

The density in a carpet is a direct function of the face weight (amount of yarn in the pile) and an inverse function of the thickness (pile height). This means that a good dense carpet will have lots of face yarn, but be very low in height. Technically, the density is calculated by the formula: $\text{Density} = 36 \times \text{face weight (oz. per square yard)} / \text{pile height (inches)}$. A good library carpet will have a density of 4,500 or higher. Carts and book trucks will roll over dense goods more easily.

The carpet face yarn construction is also important. The individual yarns are either cut or loop. Some carpets have a combination of cut and loop face yarns, and this makes variation and texture in the appearance, which can help to hide soil and stains. Two yarns of the same color will look darker or lighter than each other depending on whether they are cut or looped.

When made of cut yarn, the carpet appears darker since the cut ends, which absorb light, are visible. When loop yarn is used, the side of the yarn is visible, making it more reflective and appearing lighter to the eye. There is also a visible effect of foot-traffic with cut pile carpet since the yarns tend to “lie down” under the weight, showing the side of the yarn fibers and reflecting more light. The area of traffic then appears to be lighter than non-traffic areas. This effect causes the traffic patterns that are so readily visible in cut pile carpet and why 100% cut pile carpet is not a good choice for the common areas in the library. These traffic patterns make the carpet look worn out before it actually wears out physically.

Color and pattern are other important factors in the carpet’s appearance retention qualities. The best colors for hiding soil are those that are not too light and not too clear. The best patterns for hiding soil are those that are not too solid. Heathered yarns can create a mottled effect, yet the carpet still retains a somewhat solid appearance. Patterns and textures can result from color changes, subtle pile height variations, and cut versus loop yarns. Besides hiding soil, they can add richness and interest to the carpet aesthetics.

Interior designers will also take the yarn type and dye processes into consideration. Most library carpets are made of nylon for commercial application. Nylon fibers are strong, durable, stain-

resistant, and have good color-retention. They are also available in a low luster, so the appearance is close to the more expensive wool, without the high price. Most dye processes are *yarn-dyed* and are administered by the mills after the fibers are woven into yarn.

It is fairly easy and common practice to request custom colors for relatively small quantities. The exception is the solution-dyed process, which differs fundamentally because the dye pellets are added to the nylon when it is still in its liquid state. The dye is then integral, not topical, and these carpets can be cleaned with bleach and resist fading as well. These are, however, much more limited in their color offerings since the colors are applied by the yarn producers, not by the mills. There are only three main yarn producers: BASF, Dupont, and Solutia (formerly Monsanto), while there are at least thirty reputable commercial mills.

Broadloom Goods

Broadloom goods are carpets that come in rolls, usually 12' wide. There are two families of broadloom goods: woven and tufted. In woven carpets, the yarns are intertwined with each other, incorporating also the warp and weft in the weaving process. The backing is likewise stitched in along with the face yarns, making an entire assembly that is very strong because it is interlocked. Axminsters, jacquards, velvets, and wiltons are all types of woven carpets, made on wilton and dobby looms. Woven carpets allow the greatest design flexibility and they are very consistent, but they generally cost more than most tufted carpets.

Tufted carpets are the most commonly used carpets in commercial installations, including libraries. In tufted construction, needles carrying the face yarns puncture a primary backing, much like a sewing machine process. A secondary backing is applied to the primary backing. It is important to understand that residential carpet, particularly in tufted constructions, is not the same as commercial grade. The force needed to pull a face yarn out, called tuft bind, is much higher in a commercial grade quality than a residential grade. Broadloom goods can be installed either stretched over pad, or directly glued down to the floor slab. In a library it is recommended that the carpet be installed directly glued down instead of over pad. If some padding is desired for better foot traffic feel, additional acoustical properties, or extending the life of the carpet, a carpet with attached cushion backing (enhanced backing) can be specified.

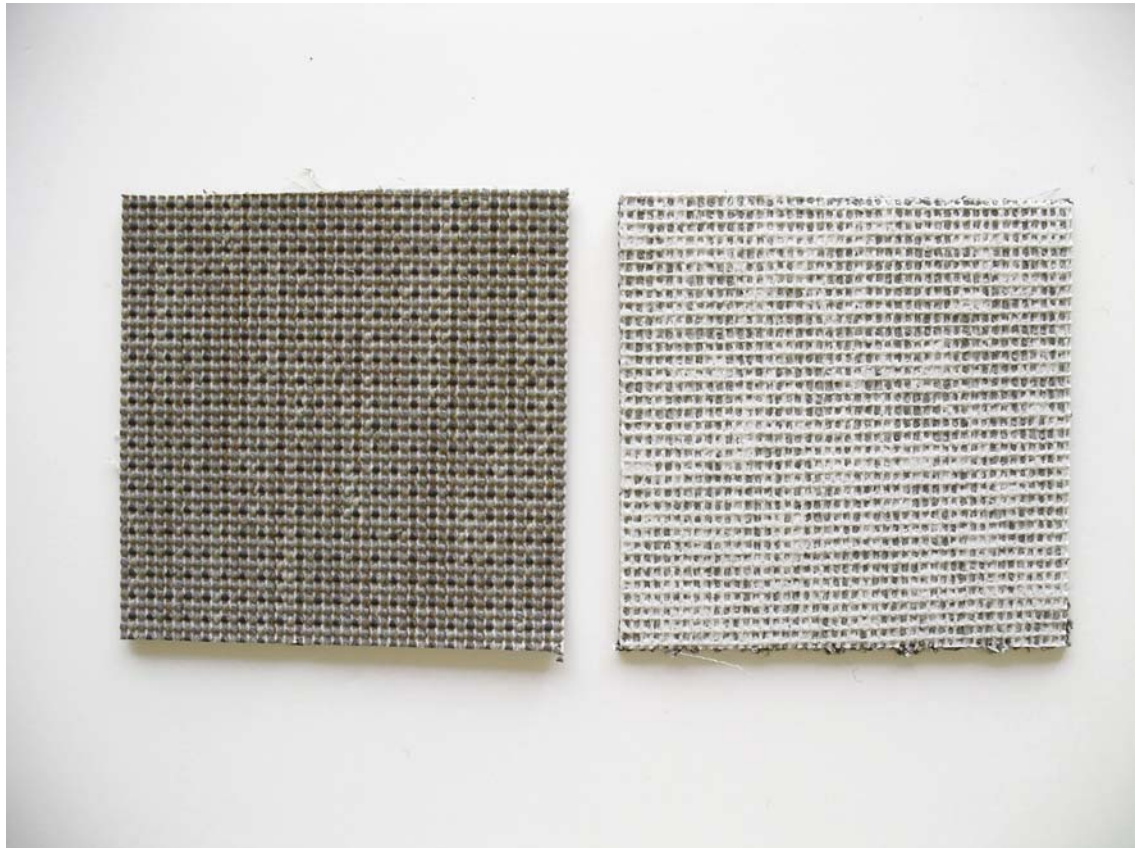


Figure 1. Woven Construction (Left) and Tufted Construction (Right).

Carpet Tiles

Over the past five to ten years, carpet tiles have improved dramatically. Once offered only in standard 18" x 18" size, they now come in the larger 36" x 36" size as well. This reduces the number of seams, yet preserves the concept of replacement or access where it's needed. Many more mills now produce carpet tiles, as well as tile versions of some of their broadloom offerings. In libraries today, raised access floor, providing a plenum below for mechanical, electrical, and telecommunications services, is becoming more and more common. This raised access floor requires the use of carpet tiles to support the great flexibility provided by the access floor system. There is even the possibility of using carpet tiles that "snap" on to the raised floor panels rather than requiring adhesives, although the cost is higher and this product is currently available through only one carpet manufacturer. This is a definite advantage from the *green* building standpoint. For further information on green materials see [Sustainable Library Design](http://www.librisdesign.org) at www.librisdesign.org.

Carpet tiles also provide the opportunity to introduce new design patterns; that is, to get very different aesthetics with simply how the same product is installed. Quarter-turning, or rotating

every other tile 90 degrees, results in a checkerboard effect that can be more or less pronounced depending on the pattern of the tile. Installing the tiles in an ashlar or staggered pattern gives a brickwork effect, and combining 18” and 36” tiles can yield a border and field effect. Carpet tiles do not fray at any cut edges, so it is easy to cut any shape or size of accent design for insertion into a field tile. While installation of carpet tiles generally costs less than the installation of broadloom goods, the cost of the product is higher than the cost of broadloom goods.

2.2 Stone

Stone is the most lasting and classic material that has been used in libraries on floors, walls, and countertops. Not a rare natural commodity, it is a very sustainable resource. Often, it is installed in the highest traffic areas of the library, such as the lobby and stairs. Because of its durability, it is a naturally value-engineered material which can be installed in infinite patterns with finely detailed insets.

Perhaps one of the least wasteful methods is called “free length” where the dimensional width of the stone is defined, and the lengths are random, ranging up to four feet. There are three basic stone groupings used in library flooring: slate, which is metamorphic stone, limestone and marble, which are sedimentary stone, and granite, which is igneous stone. But with all three, it is important to understand some basic information about finishes.

Stone Finishes

How stone is finished greatly affects its appearance. In general, as a rough stone is polished to make it smoother, it becomes darker, shinier, and more slippery underfoot. Many different surface textures are applied to stone, but the basic types, in order of roughest to smoothest, are flamed (or thermal), honed, and polished. These textures also occur in a range of variation.

Depending on the properties of the specific type of stone, particularly its hardness, stoneworkers will usually determine the most appropriate texture for the application and for showing off the stone’s natural beauty. In addition, there are treatments and coatings that are applied to the finished stone that seal and protect it, or cause it to have a higher coefficient of friction (degree of slipperiness).



Figure 2. Four different finishes of the same Belgian Bluestone. Flamed finish at left is the roughest and lightest, while honed finish at right is the smoothest and darkest.

Stone Types

Most slates are stratified rocks that are formed from shale, which is consolidated clay, mud, or silt. These are split, or cleft, into slabs. Common colors are green, gray, black, rust, and purple tones. Slates that come from the UK, Canada, and Vermont are generally more costly because they are harder than slates from China, Africa, and Brazil. Harder slates are more appropriate for library flooring. The softer slates are more suitable for residential applications. Only the hardest of slates can be honed or polished and therefore, used as countertop material for circulation, information, or reference desks. Sealants are recommended to prevent etching or oxidizing and should be applied annually after a power wash.

Limestone and marble are actually from the same calcium-based stone family. In general terminology, we refer to limestone as those that are somewhat neutral in color, while marble, which is metamorphosed limestone, contains minerals which give it all the color possibilities associated with it. Because most marble and some limestone are quite hard, they can be polished to a high reflective sheen. However, sometimes the mineral deposits or veins in the stone can be a weak point.

Granite is the hardest of all the stones, and is commonly used in very rough textures, honed (smooth but matte finished), or as highly polished as marble. Like most limestone and marble, it can be used for vertical wall faces and horizontal countertops. On a good substrate, stone floor tiles should be at least 2 cm. thick and stair treads, at least 3 cm. Wall faces take less point loading, but are usually dimensionally larger, so they too should be usually a minimum of 2 cm. in thickness.

2.3 Terrazzo

Terrazzo is a man-made composite material that consists of chips of stone aggregate mixed and set into a filler or binder, called the matrix. It is a form of mosaic and the aesthetic will vary significantly depending on the color(s) of the aggregate, the size of the chips, the proportion of aggregate to matrix, and the color of the matrix itself. When terrazzo was first invented, the chips were usually marble. Now, other commonly used materials for aggregate chips are granite, onyx, and glass.

The matrices are either cement, epoxy and polyester resins, or some combination thereof. One of the great advantages of terrazzo is the color-control and consistency that can be attained, making it excellent for multi-colored pattern and design. Sections of the terrazzo are partitioned off with divider strips that help keep the terrazzo from cracking, and allow it to be installed over very large areas. These divider strips are usually made of zinc, brass, or plastic. They can also become feature strips that outline strong graphic designs in the floor, straight or curvilinear.

When the flooring is installed, it is ground and polished in place to a high sheen. Similarly to stone flooring, terrazzo floors require relatively low maintenance and are very durable. But like polished stone floors, they must be treated with a slip-resistant sealant to bring the coefficient of friction up to the code requirement. The U.S. Occupational Safety and Health Administration (OSHA) mandates a minimum slip coefficient of friction of 0.5, and accessibility codes recommend 0.6.

2.4 Resilient Flooring

Resilient flooring is a term used to describe flooring types that repel liquids and dirt. They can be made either from synthetic materials such as vinyl and its by-products or from natural materials such as linoleum and cork. These are very practical materials because they are inexpensive, quite durable, easy to clean, require low maintenance, and offer adequate design possibilities. Most often, they are used in areas where there are liquids, such as staff lounges, activity rooms, coffee areas, part of Technical Services, and storage rooms. They also come in non-slip safety flooring for utilitarian areas.

Synthetics

Most of the synthetic floorings have a base in vinyl, whether it is pure vinyl, vinyl composition tiles (VCT), or sheet vinyl. Vinyl flooring is either homogeneous throughout its thickness, or made from layers of plastics bonded together. The top layer of the material is called the wear layer, and this is thicker in higher quality vinyls, ranging up to 20 mils.

Vinyl tiles are usually 12" x 12" square, and sheet goods are usually 6'-0" to 6'-6" in width. Traditionally, the appearance of vinyl products has been monochromatic with a marbled look. But in the past ten years, many improvements have been made both in performance and styling. Interesting design and patterns are attainable in both sheet and tile goods, by cutting and inserting different colors and border options.

Photographic processes produce images, such as a natural wood appearance, that are laminated to the vinyl just below a clear wear layer. Homogeneous vinyl flooring products have conductive carbon black mixed throughout the material and are recommended for use in computer spaces where a slower discharge of electricity may be required. Resilient flooring is very easy to maintain but it should be swept or vacuumed often, and periodically, it should be sealed and buffed to retain its luster.

Naturals

Two natural resilient flooring materials, linoleum and cork, were used in libraries a century ago and are being used in libraries today for a number of reasons.

Linoleum flooring is made from natural materials, namely, linseed oil (which comes from pressed flax seeds), wood and cork flour, natural resins, and pigments. Typically, this composite is bound to a jute backing. Because linoleum is homogeneous, there is no layer to "wear out". The thicker the material, the longer it will last, sometimes up to 40 years. Unlike vinyl flooring, linoleum does not show scuffs and scratches.

Most linoleum flooring is manufactured in Europe and therefore usually measured in metric dimensions. Tiles are available in half-meter squares, and rolled sheet goods in 2-meter widths. While linoleum does have a distinctive odor from the linseed oil, it does not emit any harmful pollutants into the air. It is a *sustainable* material utilizing renewable resources. Different patterns and colors are available which can make an attractive statement. The Main Reading Room of the Shields Library at the University of California, Davis, has linoleum flooring in a gray-green field with two accent colors that was installed in 1989.

Cork flooring is made from the outer bark of the cork oak tree, which is primarily grown in Portugal, Spain, and the northern parts of Italy. Approximately every seven to nine years, the bark is stripped, causing no damage to the tree. It is a truly renewable resource, unlike wood flooring, where the tree has to be cut down.



Figure 3. Color and pattern variations are available in cork flooring materials.

The first use of the cork is for wine stoppers, and the grainy waste from this process is used to make the cork flooring tiles. So cork tile is also a product made from recycled material. Cork comes in tiles as large as 24" x 36" and is also manufactured into interlocking 1'-0" x 3'-0" planks using the cork as a surface over a particleboard substrate. The most common thickness of the pure tile is 3/16" thick; but 5/16" is recommended for the heavy commercial use in a library reading room.

The durability and resilience of cork is due to its unique cellular structure, which allows the material to be 80% air, and it can recover 100% of its original thickness when compressed under pin-pointed pressure. This air cushion gives cork a very comfortable underfoot feel as well as good acoustic properties desirable in a library, better than any other resilient flooring material. Other advantages are its rich natural look, which is always in warm colors ranging from medium

wood tones to ebony, as well as its consistent textures and laminated layers that give a mosaic appearance.

Cork is a low maintenance material, since regular damp mopping with a mild detergent is all that is necessary for maintenance. However, cork flooring should not be used in main entrance lobbies because grit is its natural enemy. It is better to use cork in areas away from the entrance, so most street grit has dropped off. When cork is first installed, a field application of polyurethane is recommended, and every 5-7 years, this should be reapplied. Manufactured plank systems are pre-finished.

The main disadvantage of cork is its high susceptibility to fading in sunlight. Cork tends to fade quite unevenly, visible from tile to tile or will bleach out in areas exposed to direct sunlight. Cork manufacturers are now researching a new finish with UV inhibitors to address this problem. Cork is slightly more expensive than carpet tile, but it represents a good value. When the Morrison Reading Room in the Doe Library at UC Berkeley was built in the 1930's, cork flooring was installed in a parquet pattern. The Library replaced this original cork flooring in 1997 with new cork flooring, giving it a 60-year life in this popular reading room.

2.5 Ceramic Tile

Ceramic tiles are man-made fired clay tiles that are very appropriate for long-wearing floor surfaces in a library. While they have been commonly used for floors and walls in residential kitchens and commercial restrooms, ceramic tiles represent a family of products that can be much more comprehensive in their use. Porcelain tile, stoneware tile, and quarry tile are all types of ceramic tiles that are commonly used in commercial applications. Differences in the tile composition, differences in the glazing ingredients and application methods, and differences in the cooking temperature result in a wide variety of textures, sheens, effects, and colors.

Porcelain tiles are the hardest, with some types actually approaching the hardness of granite. They can be quite large in size, up to 24" x 24", since they have porcelain material in the base and are therefore fired at a much higher temperature to fuse the materials together. Stoneware tiles have a medium hardness and usually are made from a clay base with composite materials. Quarry tiles are softer than the others since they are made from an all-clay base and are fired at a lower temperature. Similar to stone, harder tiles can be larger than softer tiles, and the thickness of tiles should increase as the size of the tile increases. The largest quarry tiles are usually only 8" x 8".

Ceramic tiles can be installed either thin-set (adhesives) or in a thicker mortar-bed base with grout joints that usually range from 1/8" to 1/4". Careful consideration should be given to the selection of the grout color, as grout that is too light tends to show dirt, while a natural concrete color grout tends to retain its appearance. Besides the durability and ease of maintenance, the product is very dimensionally consistent and stable. However, there may be dye lot variations from batch to batch, particularly in orders filled over an extended time period.

2.6 Solid Hardwood Flooring

Hardwood flooring has been used in libraries for centuries. It is fairly expensive, so it is often found in upgraded areas such as special collections rooms and main reading rooms, where it gives a warm, welcoming, and rich look. Wood floors generally can be refinished many times and treated with sealers and polyurethane coatings that restore their original beauty.

The most popular wood species for flooring is oak, both white oak and red oak, which have subtle color variations and shading. Oak takes stain well and can range from whitewashed and clear finishes to medium and darker tones. Maple is also used in contemporary libraries because it has a very condensed fine grain, is fairly uniform in appearance, and has less texture than oak. Maple is quite light in coloration and, because of its hardness, is not porous and does not take staining well.

The recommended installation for a heavy traffic commercial installation is the use of $\frac{3}{4}$ " thick planks that have tongue and groove edges. Each plank is installed individually over a $\frac{3}{4}$ " plywood subfloor which is in turn installed on top of the structural floor. Because this assembly measures 1.5 to 2 inches in height, areas where hardwood floor will be installed must be recessed into the floor structure if a smooth transition is to be made to an adjacent material such as carpet.

Within the last ten to fifteen years, there has been significant development of "engineered" wood flooring products, which are commonly used in commercial installations now and are very suitable for library use. These have wood veneer faces bonded to a substrate of a less costly material that is dimensionally stable, like plywood. The veneer face is quite thick, usually $\frac{3}{8}$ " to $\frac{1}{2}$ ". The heavy-duty commercial grade types also have veneer that is impregnated with acrylic resins that make them much tougher than those that are not treated in this manner. The main advantage of the engineered floor over the solid hardwood is that it does not shrink and expand as much as the solid and can therefore be installed in a glue-down installation. But as with all types of glue-down installations, it is important that the subfloor be flat and dry.

3. CEILING FINISHES

Ceiling systems are the support structure for many functions in a library. They incorporate lighting, ventilation, fire sprinklers, and acoustic functions of the spaces. They can be functional and essentially unnoticed by the library patrons, such as when acoustical ceiling tiles are used, or they can enrich and define a room's character, such as might occur with the use of a wood plank ceiling system. Ceiling surfaces are also used to reflect light from indirect (up-light) fixtures to give a uniform low-glare light quality and a bright ceiling.

3.1 Suspended Acoustic Tile

Suspended acoustical ceilings are sound absorptive panels that fit into a metal frame suspended by wires from the floor or roof structure above. This system is the most cost effective way to provide good acoustic performance, depending on the perforations or fissures of the tiles.

The ability of a ceiling or a wall panel to absorb sound is measured by its noise reduction coefficient (NRC). The recommended minimum NRC for ceiling tiles in a public library is 0.65. The common sizes of the ceiling grids are 2' x 2' and 2' x 4', and the lighting system is often incorporated into this grid as well. *Concealed spline or grid* ceilings are available, but not recommended in libraries since they often have alignment problems after maintenance staff has removed tiles for access to plumbing or air systems above. (For further information on FRC ratings see [Acoustics for Libraries](#) at www.librisdesign.org.)

3.2 Acoustic Wood Slat

There are pre-assembled wood ceiling panels available on the market in different species of wood such as oak, cedar, and hemlock. Essentially, slat panels are made from wood slats attached to system rails, and these panels are attached to a suspension system using clips. The panels are actually open to the underside of the structure above so that air and light can pass through.

The slats are kept parallel by the use of inconspicuous wooden dowels. Dowels are available also in a more flexible material like plastic, which allows for curves in the slats. The slats can be thicker, giving the ceiling a more grille-like appearance, or flatter, rendering the ceiling plane like a wood surface articulated with reveals. There are many profiles and slat-frequencies available. These ceilings, particularly the ones with the deeper slats and backed by invisible acoustic absorption material, provide a handsome surface with a very high NRC.

3.3 Glass Fiber Reinforced Gypsum

Glass fiber reinforced gypsum (*GRG*) is a high-strength, lightweight composite of gypsum reinforced with glass fibers. It is custom-molded in the factory to almost any shape or size. But once made, it is rigid and cannot be bent. *Pin dot* (small holes) or larger perforations are available in the surface to increase the acoustical properties. In addition, the product is non-combustible and can be taped and painted like gypsum wallboard. Ceiling GRG elements are usually suspended from the floor above and come in typical thicknesses of 1/8" to 3/16". Because of its light weight and ease of installation, GRG costs less than traditional plaster and other trades can continue to work while it is being installed.

4. WALL FINISHES

There are few walls in a library, since they are quite open usually for open spaces with stacks and supervision by library personnel. Nevertheless, wall surfaces are important for the acoustic, aesthetic, and functional aspects of the spaces.

4.1 Paint

Paint is the most commonly used product for wall surfaces in a library. There are hundreds of choices of standard colors available in addition to computerized custom color matching. Numerous applications for paint range from walls, doors, frames, and millwork to fire-resistive paints for exposed metal columns and structures. There are two major types of interior paints: latex, which is water-based, and alkyd, which is oil-based. Latex paints clean up with water and soap, while alkyd paints must be cleaned with hydro-carbon based thinner. The most commonly used type of paint in the library is latex because of the ease of clean-up. A minimum of two coats should be applied to a primer coat. Paint is usually applied in the field but metallics, such as door frames, are normally factory-painted in a controlled environment. There are five different levels of sheen that are available in both latex and oil-based paints: flat (or matte), eggshell, satin, semi-gloss, and gloss.

In general, a shinier paint finish will be more durable and washable. Imperfections in the wall surface, however, will be more apparent with high-sheen finishes because of the light reflectivity. In a public library, the only area where flat finish should be used is the painted ceiling, where contact is not possible. Most walls will have an eggshell finish, which is still washable and durable, and yet still hides most wall imperfections. Semi-gloss and gloss are rarely used except for certain accent surfaces or trim, and in restrooms or kitchenettes.

There are specialty coating systems similar to paint that produce a multi-flecked look. These products have additives that help make them more durable and lasting, but they require a highly skilled laborer to apply them since they are sprayed on. Specialty coating systems are generally useful for hiding fingerprints and pen marks, but heavy-duty impacts or penetrations are difficult to repair. A professional is required to fill any dents and reapply the coating, which might be hard to blend and match with the surrounding surface textures and colors. However, the multi-fleck coating product can be scrubbed more than textural plasters.

4.2 Wood Veneer

Wood paneling is a wall treatment that can enhance a space and create drama by introducing a rich natural finish with the elements of color, texture, scale, and modularity. The extent of a wood wall treatment is influenced primarily by design concepts and budget. In libraries, hard woods, such as oak, maple, and cherry, are usually used since they provide the most durable finish. Some application examples are: entry feature-walls behind circulation or accounts desks, permanent signage walls for donors, directories or library name, stack end panels, walls and ceilings in special collection areas and in club-like main reading rooms. Since wood paneling belongs in the casework and millwork categories, coordination for consistency with other woodwork installations on the project, such as information desks and library furniture, is important. Almost all wood paneling is veneer, a thin slice of wood cut from a log. The veneer is glued to a substrate such as $\frac{3}{4}$ " particle board, fiberboard, or plywood. Typically, these substrates are available in 4' x 8' panels, so panel joints must be designed and coordinated accordingly. The manner in which the lumber is cut from the log at the mill, as well as the characteristics of the log itself, will determine the final appearance of the grain pattern. There are five basic keys to veneer selection: color, cut, figure, quantity, and length.

Veneer *colors* go from light to dark and browner to redder. Often, a wood species will be selected based on color. There are three basic *cuts*:

- *rotary cut*, where the log is “peeled” from the outside edge toward the center of the log;
- *plain cut*, where the log is sliced in parallel cuts;
- *quartered cut*, where the log is cut into quarters and then cut into parallel slices.

The *figure* refers to the patterning character of the wood itself, such as *birdseye*, *pomele*, *beeswing*, *fiddleback*, *heavy*, or *light*. *Quantity* is the rough estimate of the square footage required. It is always important to keep in mind that veneer is a natural material, and proper selection requires the designer to choose the *flitches*, or wood slices, and mark them for the specific parts of the library. The availability of enough pieces from logs that are aesthetically compatible is especially important in larger projects. *Length* is the final factor. The length of a veneer is limited by the distance from the base of the tree to where the first branch occurs, which is usually around ten feet.

The veneer flitches usually range in width from 6" to 10". When applied to the substrate, the veneers are either *book-matched* or *slip-matched*. In book-matching, every second piece is reversed so that the adjacent leaves form a symmetrical and opposing grain pattern. In slip-matching, the veneers are placed side by side with the same face sides exposed.

Wood paneling requires more delicate attention than other wall surfaces. Similar to a wood floor, paneling is susceptible to scratches and abrasions. However, it tends to hide fingerprints and smudges, which makes the product appearance more timeless. There are a variety of products

available to clean and maintain wood finishes on a regular basis. However, refinishing may be needed depending on the location and initial quality of the wood panels.

4.3 Acoustic Wall Board

Acoustic wall panels are panels made of a medium-density, resin-sealed, fiberglass core that are mounted on the walls of libraries. Functionally, they improve the acoustics of the room, provide tack surface for posting, and enrich the beauty of the space. The panels are mounted on the library walls with different types of mechanical fasteners, magnetic fasteners, or adhesives, and range in surface area up to 5' x 10'. Thicker acoustic panels have a higher NRC. These panels are often covered in vinyl or fabric wallcovering selected by the designer, and can employ many different edge conditions. The panels are often used as acoustic ceiling board as well, where more choice of finishes is available since durability is less of a concern. In both applications, the panels are butted against each other to provide a clean monolithic appearance; this type of installation also eliminates the need for fabric or vinyl seams. (For further information on NRC ratings see [Acoustics for Libraries](http://www.librisdesign.org) at www.librisdesign.org.)

5. WINDOW TREATMENTS

As with any other interior finish, it is important to consider window treatments at the beginning of the project when the budget is being set. Usually, window treatments are documented in the architectural drawings and coordinated by the general contractor. This is recommended since window coverings are often electrically operated and should therefore be coordinated with the electrical engineering consultant or technology consultant. When the window coverings are manually operated, they can be included in the furniture budget and installed later.

The main function of window treatments is to provide sun and glare control, particularly on the southern and western exposures. Additionally, they may be used at interior glass walls to provide privacy. The types of window treatment usually suggested for libraries are blinds (vertical and horizontal) or mesh fabric shades. For audiovisual rooms, blackout shades are required, and these are often used in conjunction with the normal window treatment.

5.1 Blinds

Vertical blinds are made of slats that run vertically and stack to the sides when open. The individual slats, usually 3" in width, can be adjusted to block out light in varying degrees. They are available in many colors, and can be either solid or perforated, and made of metal or vinyl. While it is relatively simple to replace an individual slat, blinds are not recommended for the heavy-use areas of the library because they bend and tend to get out of alignment.

Horizontal blinds are made of slats that run horizontally and stack at the top when open. The individual slats are usually 1” wide and made of wood, plastic or metal, which is slightly curved for better light reflectance. Similar to vertical blinds, they can be adjusted with a hand wand to provide shade from sunlight. Horizontal slats collect dust and need to be cleaned often. If horizontal blinds are used in the library, they should be located only in the office areas.

5.2 Mesh Fabric Shades

Mesh fabric shades are the recommended window treatment for the public library. They operate from top to bottom in a rolling mechanism that can be manual or electric. The roll of the shade can be hidden in a pocket above the ceiling or mounted inside the window frame, provided the window is not too large. The mesh comes in neutral colors ranging from off-white to black, and can have different degrees of openness. The more open the fabric mesh, the less obstructed will be the view through the window, but the sun and glare control will also be less. Darker meshes are less conspicuous both during the day and at night, and provide better sun and glare control than light-colored fabric mesh because they do not themselves reflect any light or glare. Outside views are also better seen through the medium to darker gray mesh colors.

6. NEW VERSATILE RESINS

Colored opaque resins were a popular material in the 1980’s for occasional tables called drum tables. They became quickly dated and scratches showed on the smooth surfaces over time. Recently, however, durable and scratch-resistant resins have become available on the market and are being used in new practical applications.

There are three types of resins: acrylic, polycarbonate, and polyester, each with slightly differing properties. Their beauty stems from their clear and translucent qualities that were not possible before, since the clear resins had a tendency to yellow. Visually, these resins look like glass, either clear or frosted. Color can be applied on the back or sandwiched in between layers resulting in a glowing effect, which can be particularly attractive when illuminated from behind. Besides color, actual materials such as fabric or meshes, or natural forms such as leaves, reeds, or bamboo stalks, can be encapsulated between the layers.

The resin material is lighter and stronger than glass, does not yellow, and is easy to cut with a saw or other common tools. These are products suitable for both interior and exterior use. In a library, some applications could be for walls and partitions, sculpture, signage, furniture, displays, doors, and any surface materials. The resin material should be used for design impact, since the cost can be relatively high.



Figure 4. Fabric and natural forms laminated into resin materials are available in many colors.

7. COLOR

Colors, like fashion, tend to go in and out of style. It can be challenging to find a “timeless” color scheme when color is so subjective, and when there are many participants in design decisions. Here are some general guidelines that designers will keep in mind:

- Generally, the color scheme for the interior should coordinate with the exterior. A consistent statement is more successful and classic.
- Trendy colors can be exciting, but these are best used with items that can be changed out more easily when they are out-of-date or become tiresome, just like wall paint.
- Bold colors are usually more successful in smaller amounts like signage or accents in carpet or fabric or wall paint.
- Neutral colors are timeless but are also sometimes viewed as bland. More contrast in tones and textures adds interest and practicality.

- The designer’s goal is to come up with a system of interior finishes and colors that will allow latitude for the different functions in the library. Perhaps the children’s area is the brightest, the teens’ area the most “hip”, and the business reading room the most sedate. But they should all relate and add to the identity of the building.
- People and books will provide color. Libraries are busy, vital, alive spaces, filled with people, displays, and activities, signage, and very colorful publications. Even computer screens will be filled with color displays. Selected colors for the building interiors should complement this array of daily changing colors.

8. GLOSSARY OF TERMS

<i>Access Floor (also called Raised Floor, Low Profile Floor or High Profile Floor)</i>	A structural floor composed of modular lift-out floor panels (commonly 2 feet square) set on pedestals, leaving an under-floor plenum space for ducts, conduits, cables, etc. Most floor panels can be surfaced with carpet tile and resilient flooring.
<i>Bid Package</i>	The set of documents issued to contractors bidding on construction. It includes working drawings, material and performance specifications, general conditions, the bid form, and other related instructions.
<i>Book-matched Veneer</i>	Veneer installation method where every second piece is reversed so that the adjacent leaves form a symmetrical and opposing grain pattern.
<i>Broadloom Goods</i>	Carpet that is rolled. Usually the width of the roll is approximately 12’-0” wide, although some are as wide as 13’-6”.
<i>Carpet Tile</i>	Squares (or rectangles) of carpet adhered to a rubber-like, dimensionally-stable backing. This allows for replacement of individual tiles and is generally required with raised access flooring.
<i>Concealed Spline</i>	A ceiling tile system employing a linear metal strip system where adjacent tiles are held in place over the metal strip or spline concealing it. The only visible elements are the ceiling tiles themselves.
<i>Cut Yarn</i>	Cut yarn construction occurs if the loops of face yarn made by the needle as it stitches up and down through the carpet backing are cut at the top, leaving the ends exposed. Cut ends of the same color carpet appear darker than the loop ends because they absorb rather than reflect light.
<i>Density</i>	The compactness of the yarn fibers of a carpet face; how tightly packed together they are. High ounce weight and low pile height are characteristics of dense carpets.
<i>Figure</i>	Patterns in wood veneer. This results from the characteristics of the specific tree and the way the veneer is cut. Some examples of

	different figures are birdseye, beeswing, fiddleback, and pomele.
<i>Flitches</i>	Pieces of wood veneer, usually to a 10-foot length, in their unfinished state.
<i>Free Length</i> (also called <i>Random Length</i>)	Method of stone patterning, where the width of the stone is given as a specific dimension and the length is stated as a range.
<i>Glass Fiber Reinforced Gypsum (GRG)</i>	GRG is a building material used in most applications like sheetrock, for flat or gently curved surfaces, usually ceilings and walls. It is a high-strength, lightweight composite reinforced with glass fibers. It can be taped and painted like sheetrock, and can be perforated to improve acoustic properties.
<i>Honed Finish</i>	A mid-level stone-smoothing finish between rough and polished. The cleft, or split, stone face is machine-sanded with diamond dustpads of varying grit size. The larger the grit size, the darker the color and the higher the sheen.
<i>Loop Yarn</i>	In carpet construction, the needles pull the face yarns up through the backing and then return down through it for the next stitch. This results in a yarn loop. If these loops are left complete, the construction is referred to as loop construction.
<i>Performance Standard</i>	Term used to define a product based on measurable characteristics, rather than definition by manufacturers' specifications. Aesthetics are sometimes considered a performance standard.
<i>Resilient Flooring</i>	Flooring materials that repel liquids and dirt. They are wipeable and come either in tile or roll goods.
<i>Slip-matched Veneer</i>	Veneer installation method where sequential veneers are placed side by side with the same face sides exposed. This results in a "repeat" pattern on the finished surface.
<i>Sole Sourcing</i>	Selection of a finish or product specific to only one supplier.
<i>Sustainability</i>	The overall impact of using a specific finish or product that does not damage the environment; but rather improves it. This would include consideration of what the material is, where it originates, how it is transported, what manufacturing processes it undergoes, its life cycle length, and how it is disposed.
<i>Terrazzo</i>	Hard-surface flooring that has a mosaic appearance due to its construction. Aggregates of marble, glass, granite, or onyx chips are embedded in a matrix of either cement or resinous material. Terrazzo can be poured in place or precast.
<i>Tufted Carpet</i>	Carpet consisting of a primary and a secondary backing. The face yarns of the carpet are stitched into the primary backing. The secondary backing is adhered afterwards. This is the most common carpet construction used in libraries and offices today.
<i>Veneer</i>	A thin layer of real wood, usually 1/28" thick, cut from the tree in different ways that result in different patterning. The veneer is attached to a substrate and used in wall and furniture surfaces.

Vinyl Composition Tile (VCT) Flooring tiles, usually 12” square, that are made of plasticizers, stabilizers, and fillers (usually clay and limestone composites) under a vinyl wear layer. VCT is a very inexpensive, durable, commercial-quality flooring material commonly used in institutional applications.

Woven Carpet Carpet where all the face yarns of the warp and weft are intertwined with the backing. Woven carpets have high dimensional stability, and no delamination of the backing since it is integral to the construction.

9. REFERENCES AND OTHER SOURCES OF INFORMATION

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