

FACTORY FINISHING

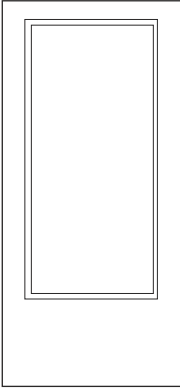


Fig. 1400-D-48

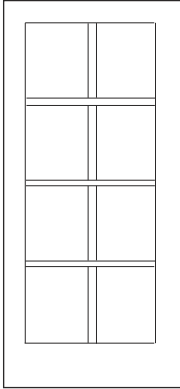


Fig. 1400-D-49

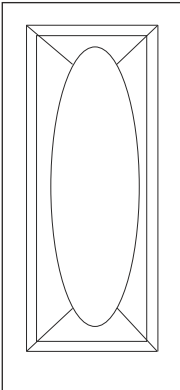


Fig. 1400-D-52

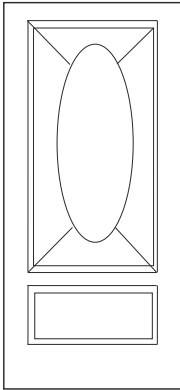


Fig. 1400-D-53

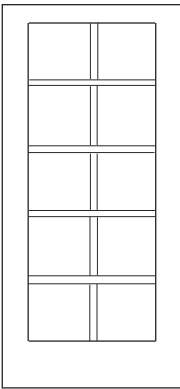


Fig. 1400-D-50

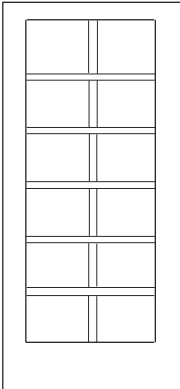


Fig. 1400-D-51

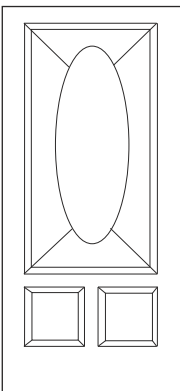


Fig. 1400-D-54

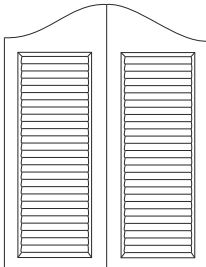


Fig. 1400-D-55



General Criteria

1500-G-1

Scope

This section establishes criteria for Premium, Custom, and Economy Grade factory finishes.

Includes:

- The application of transparent or opaque finish on architectural woodwork at the factory, or at a dedicated finishing facility, prior to delivery to the job site.
- The application of primer prior to delivery to the job site for final paint finish to be applied later by others.

Excludes:

- Finishes applied at the job site (with the exception of site touch up and repair as a result of installation).
- Items to receive subsequent coats of finish materials by others.
- All work not factory finished under the scope of work for the custom woodwork manufacturer.
- Exterior painting or priming.
- Brush applied top coat finishes except as specifically called out under the scope of work for the custom woodwork manufacturer, such as faux finishes.
- Raw wood parts on HPDL cabinets except as specified in the contract documents, such as wood finger pulls or wood drawer bodies incorporated into the assembly.
- Job site touch up after delivery or installation, covered in Section 1700, Installation.

 Exception:

When field finishing is specified or assigned under the contract documents and this standard is referenced to that part of the work, field finisher shall examine and accept the woodwork as supplied prior to commencement of finishing. The field finisher is then responsible for field finishes which meet or exceed architect's sample for performance characteristics, color, texture, and sheen. This includes, but is not limited to, proper surface preparation, shading, and blending of color and sheen as defined in this standard.

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Description and Purpose

While factory finishing is not limited to the following, the specifying of this additional service is usually selected for high-quality work where superior appearance and performance of the finish is desired. Benefits of factory finishing include consistency, control of film thickness, environmental compliance, and the curing of the finish in a controlled atmosphere. Its use assumes a maximum degree of shop prefabrication so that site installation can be performed with a minimum amount of cutting, fitting, and adjustment to facilitate project completion.

The purpose of finishing woodworking is twofold. First, the finish is used traditionally as a means to enhance or alter the natural beauty of the wood. Second, the finish must protect the wood from damage by moisture, contaminants, and handling. It is important to understand that a quality finish must offer acceptable performance and also meet the aesthetic requirements of the project.

This standard illustrates a number of finishing systems. The finishing system provides a protective surface for the product. Some of these systems are in general use; others are intended for special conditions and can only be applied under a strictly controlled environment. The tables later in this section help identify the finishing system best suited for the needs of a specific project. The cost of the systems vary, the higher performing finishes usually being more costly than the lower performing finishes. Unnecessary cost could be added to a project through over specification.

1500-G-3

Quick Comparison and Usage Guides to Factory Finish Systems

The tables on the next pages give the design professional an overview of the typical finish systems and specialty systems used by architectural woodwork manufacturers. The *left side* of the first table shows commonly available choices. The *right side* shows specialized finishes. There are other systems, and those should be evaluated and specified by the design professional with the guidance of the manufacturer when desired.



Cautions

- Systems are usually *not* compatible with each other. Trying to intermix systems could cause quality and/or performance problems.
- Old fashioned or consumer-oriented brush applied finishes are not recommended for factory finished fine architectural woodwork, and are not covered by this Section of the Standards.
- Finish systems often fail because too much top coat material is applied. Check with the finish system supplier for advice.

The tables compare the typical areas of concern when selecting a top coat for fine woodwork. As with the more extensive Finish System Performance Tables later in this section, this chart only deals with topcoats, not the addition of color or paste filler of any kind.

When specifying, please use the system name as set forth in this edition. **Because finishing systems are changing so rapidly, we have discontinued the use of system numbers.** Involve your woodwork manufacturer early in the design process to evaluate the systems in relation to your project requirements. Choose performance characteristics which meet, but do not exceed, the needs of your project in the interest of value engineering.

Many prefinished real wood panels and decorative overlays have æsthetic and performance characteristics which meet or exceed these standards, and shall be evaluated, approved and specified by the design professional when desired.

The listing of a finish system in this book does not imply an endorsement of the materials and/or methods or compliance with federal and/or local Environmental Protection Agency or other requirements. Some finishing professionals have, for example, found that polyurethanes and/or polyesters require special finishing procedures for a quantity of laboratory casework. Check with the finishing supplier for recommendations in the use of these products. In cases like these catalyzed vinyl shall be the topcoat of choice.

Note: This table does not represent *all* possible top coats. Other options will be found in the text on following pages.

Quick Comparison Guide to Factory Finish Systems										
Finish System	Standard production finishes (commonly available)					Specialty finishes (specify after consultation)				
	Nitrocellulose Lacquer	Pre-Catalyzed Lacquer	Post-Catalyzed Lacquer	CAB & Water Acrylic Lacquer	Conversion Varnish	Synthetic Penetrating & Simulated Oil	Catalyzed Vinyl	Catalyzed Polyurethane	Polyester	UV cured Epoxy, Polyester, Urethane
General durability	2	2	3	2	4	1	4	5	5	5
Repairability	5	4	4	3	3	5	4	2	1	1
Abrasion resistance	2	4	4	3	4	1	4	5	5	5
Finish clarity	5	4	5	4	3	5	3	3	4	5
Yellowing in time	1	2	3	4	4	2	3	4	4	3
Finish flexibility	1	2	3	3	4	5	4	4	1	3
Moisture resistance	3	3	4	3	4	1	5	5	5	5
Solvent resistance	1	2	4	1	5	1	5	5	5	5
Stain resistance	4	4	5	4	5	1	5	5	5	5
Heat resistance	1	2	5	1	5	1	5	5	5	5
Household chemical resistance	3	4	5	3	5	2	5	5	5	5
Build/Solids	2	3	3	4	4	1	4	4	4	5
Drying Time	5	5	5	3	4	2	5	3	2	5
Affects wood flame spread	Yes	Yes	Yes	No	No	No	No	No	Yes	No

5 = Excellent to 1 = Poor: The numerical ratings are subjective judgements based on the general performance of generic products. Special formulations and facilities will influence some of the performance characteristics.

Absent from this table are such common finishes as varnish, pre-mixed polyurethane, enamel paint, and other typically brush-applied topcoats. As stated in the *exclusions* at the beginning of this section, these topcoats could be specified, but are not covered by this standard. Data on fire-retardant topcoats and UV-cured systems may be found later in this text.

Quick Usage Guide to Factory Finish Systems

System	Usage Examples	Notes
Standard production finishes (commonly available)		
Nitrocellulose Lacquer	For interior use for trims, furniture, paneling, and ornamental work	Fast drying and easy application; low solid build; easy to recoat and repair; yellows on aging; poor water and solvent resistance
Pre-catalyzed Lacquer	For interior use for furniture, casework, paneling, ornamental work, stair parts except treads, frames, windows, blinds, shutters, and doors	Fast drying and easy application; medium solid build; good abrasion resistance and finish clarity; good stain and chemical resistance; some yellowing over time
Post-catalyzed Lacquer	For interior use for furniture, casework, paneling, ornamental work, stair parts except treads, frames, windows, blinds, shutters, and doors	Fast drying and easy application; medium solid build; good abrasion resistance and finish clarity; good stain and chemical resistance; some yellowing over time
CAB & Water Acrylic Lacquer*	For interior use for furniture, casework, paneling, ornamental work, stair parts except treads, frames, windows, blinds, shutters, and doors	Most have low VOCs; medium drying and application characteristics; good finish clarity and resistance to yellowing; good stain resistance
Conversion Varnish	For interior use for furniture, casework, paneling, ornamental work, stair parts, frames, windows, blinds, shutters, and doors	A two-part, catalyzed system; fine durability with excellent abrasion, solvent, stain and chemical resistance; moderately fast drying; resists moisture and yellowing over time
Specialty finishes (specify after consultation)		
Penetrating Oil	For interior use on furniture or trims requiring a close-to-the-wood look or very low sheen	Easy to apply and must be maintained over time; easy to repair; low resistance properties
Catalyzed Vinyl	For interior use, often on kitchen, bath, office furniture, and laboratory casework	Two-part, fast drying system; some yellowing; durable; excellent general resistance to damage
Catalyzed Polyurethane	For interior use; some formulas available for exterior; floors, stairs, high impact areas; some doors; generally not good for casework, paneling, windows, blinds, shutters	Two-part, slower curing system; difficult to repair; durable; excellent general resistance to damage; many different performance/quality levels
Polyester	For interior use for furniture, casework, paneling, ornamental work, windows, blinds, shutters, and some doors	Highly durable, slow curing finishes requiring special application facilities and skills; very difficult to repair; brittle finish flexibility
UV curable Epoxy, Polyester, Urethane	For interior use, doors, paneling, flooring, stair parts, and casework where applicable. Consult your AWI or AWMAC finisher before specifying.	Highly durable, fast curing finishes requiring specialized curing reactors. Performance level depends on coating formulation.

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Wood Finishes, Steps and Color

A variety of finishes are available for wood products. Aesthetically, systems may vary from no stain, to a single stain, to a multiple step application. Some samples will require multiple color and finish steps in order to meet the architect's requirements. The existing system specified may not include all steps necessary to match the architect's example or requirements. Color and grain enhancement of some finishes require the build of one color step on another. This will sometimes require an additional step of a protective wash coat between color steps. Generally, this procedure adds to the depth, beauty of the finish. Each added step increases costs and shall be specified. Some of the added steps are listed in the glossary of this section, and are marked with an asterisk.



Caution

Special consideration should be given to raw wood parts on high pressure decorative laminate-clad (HPDL) cabinets such as wood pulls, wood trims, applied mouldings, banded doors, drawer bodies, and wood cabinet interiors. Specifications regarding the responsibility for finishing (if any) shall be clarified by the design professional.

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Finishing System Descriptions

The tables on the following four pages are divided into two classifications. The first two tables illustrate the performance characteristics of commonly available production finishes. While not all factory finishers can provide all types of finish, these are ones usually available in most markets.

The second pair of tables show the performance characteristics of a number of specialty finishes. Only a select few factory finishers can furnish these systems, and even then only one or two of the systems shown will be available by any single finisher.

Finishing system test data – The systems tested were evaluated in an ISO 9000 certified laboratory using the following ASTM test criteria:

Chemical Resistance Testing - ASTM D1308-87 (reapproved 1998)

Wear Index - Abrasion Resistance Testing - ASTM D4060-95

Cold Check Resistance - ASTM D1211-97

Cross Hatch Adhesion - ASTM D3359-97

Base line data for application prior to testing:

- A. 45-55% humidity at 70-80 degrees Fahrenheit
- B. Water borne coatings must be cured in a de-humidified atmosphere and can be assisted with Infrared light and good air movement

The long standing AWI performance indicator numbers are used, with the following definitions:

For chemical resistance and wear index - abrasion resistance:

- 5 - No effect from the test
- 4 - Minimal effect or slight change and little repair required
- 3 - Some effect, noticeable change and the coating will recover with minimal repairs
- 2 - Moderate effect, performance adversely affected and repairs required
- 1 - Poor performance and film failure is imminent and repairs difficult

For cross hatch adhesion

- 5 - Edges of the cuts are completely smooth; none of the squares of the lattice are detached
- 4 - Small flakes of the coating are detached at intersections; less than 5% of the area is affected
- 3 - Small flakes of the coating are detached along edges and at intersections of cuts; 5 to 15% of the area is affected
- 2 - Coating has flaked along the edges and on parts of the squares; 15 to 35% of the area is affected
- 1 - Coating has flaked along the edges of the cuts in large ribbons and whole square have detached; 35 to 65% of the area is affected

	Performance
	5 = Excellent
	4 = Very Good
	3 = Good
	2 = Fair
	1 = Poor
Key to the Finish System Performance Tables on next 4 pages	
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Standard Production Finishes

THE TABLE IS COMPOSED OF THE TWO PAGES AS THOUGH ONE TABLE



Note: **Total** and **Score** at the bottom of the tables must be used carefully as a guideline for system selection. *Generally*, although a higher score is a higher performing finish, it is not usually wise nor a good use of the client's money to specify the highest score possible. Specify only as much *performance* as is required for the intended use and exposure.

8th Edition System Name	Nitrocellulose Lacquer Transparent	Nitrocellulose Lacquer Opaque	Precatalyzed Lacquer Transparent	Precatalyzed Lacquer Opaque	Postcatalyzed Lacquer Transparent
Vinegar	5	5	5	5	5
Lemon Juice	5	5	5	5	5
Orange Juice	5	5	5	5	5
Catsup	5	5	5	5	5
Coffee	5	4	5	5	5
Olive Oil	5	5	5	5	5
Boiling Water	5	5	5	4	5
Cold Water	5	5	5	5	5
Nail Polish Remover	1	1	2	2	2
Household Ammonia	3	2	5	5	5
VM&P Naphtha	4	5	5	5	5
Isopropyl Alcohol	1	2	2	5	3
Wine	5	5	5	5	5
Windex™	3	1	3	4	4
409 Cleaner™	4	1	3	2	4
Lysol™	5	5	5	4	5
33% Sulfuric Acid	5	5	5	5	5
77% Sulfuric Acid	3	3	1	1	1
28% Ammonium Hydroxide	1	2	2	4	2
Gasoline	3	5	5	5	5
Murphy's Oil Soap™	5	5	5	5	5
Vodka 100 Proof	4	5	3	2	5
1% Detergent	4	5	5	5	5
10% TSP	4	5	5	5	5
TOTAL	95	96	101	103	106
Wear Index	2	3	3	1	3
Cold Check	5	5	5	5	5
Adhesion	5	4	5	5	5
SCORE	107	108	114	114	119

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Standard Production Finishes (continued)

8th Edition System Name	CAB Acrylic Lacquer Transparent	CAB Acrylic Lacquer Opaque	Water Acrylic Transparent	Water Acrylic Opaque	Conversion Varnish Transparent	Conversion Varnish Opaque
Vinegar	5	5	5	5	5	5
Lemon Juice	5	5	5	5	5	5
Orange Juice	5	5	5	5	5	5
Catsup	5	5	5	5	5	5
Coffee	5	5	5	5	5	4
Olive Oil	5	5	5	5	5	5
Boiling Water	5	5	5	5	5	5
Cold Water	5	5	5	5	5	5
Nail Polish Remover	1	1	2	1	4	5
Household Ammonia	5	5	1	5	5	5
VM&P Naphtha	4	5	5	5	5	5
Isopropyl Alcohol	1	1	5	1	5	5
Wine	5	3	5	5	5	5
Windex™	2	3	1	4	5	5
409 Cleaner™	5	5	2	4	5	5
Lysol™	5	5	3	4	5	5
33% Sulfuric Acid	5	5	5	4	5	3
77% Sulfuric Acid	1	1	1	1	1	1
28% Ammonium Hydroxide	2	5	1	4	5	5
Gasoline	2	2	5	5	5	5
Murphy's Oil Soap™	5	5	5	4	5	5
Vodka 100 Proof	4	2	5	5	5	5
1% Detergent	5	5	5	5	5	5
10% TSP	5	5	4	5	4	4
TOTAL	97	98	95	102	114	112
Wear Index	2	3	4	4	5	4
Cold Check	5	5	5	5	5	5
Adhesion	5	3	5	5	5	5
SCORE	109	109	109	116	129	126

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Specialty Finishes (specify only after consultation)

THE TABLE IS COMPOSED OF THE TWO PAGES AS THOUGH ONE TABLE

Note: **Total** and **Score** at the bottom of the tables must be used carefully as a guideline for system selection. *Generally*, although a higher score is a higher performing finish, it is not usually wise nor a good use of the client's money to specify the highest Score possible. Specify only as much *performance* as is required for the intended use and exposure.

8th Edition System Name	Synthetic Penetrating Oil	Catalyzed Vinyl Transparent	Catalyzed Vinyl Opaque	Catalyzed Polyurethane Transparent	Catalyzed Polyurethane Opaque	
Vinegar	5	5	not tested	5	5	
Lemon Juice	5	5		5	5	
Orange Juice	4	5		5	5	
Catsup	4	5		5	5	
Coffee	4	5		5	5	
Olive Oil	5	5		5	5	
Boiling Water	4	5		5	5	
Cold Water	5	5		5	5	
Nail Polish Remover	1	2		3	4	
Household Ammonia	1	5		5	5	
VM&P Naphtha	5	5		5	5	
Isopropyl Alcohol	2	5		5	5	
Wine	4	5		5	5	
Windex™	1	3		5	5	
409 Cleaner™	1	5		5	5	
Lysol™	3	5		5	5	
33% Sulfuric Acid	5	5		5	5	
77% Sulfuric Acid	1	2		3	2	
28% Ammonium Hydroxide	1	5		5	5	
Gasoline	5	5		5	5	
Murphy's Oil Soap™	2	5		5	5	
Vodka 100 Proof	3	4		5	5	
1% Detergent	4	4		5	5	
10% TSP	1	5		5	5	
TOTAL	76	110			116	116
Wear Index	1	5		5	4	
Cold Check	5	5		5	5	
Adhesion	5	5		5	5	
SCORE	87	125			131	130

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Specialty Finishes (Continued)



NOTE to SPECIFIER
on specialty finishes and UV
cured coatings

8th Edition System Name	Catalyzed Polyester Transparent	Catalyzed Polyester Opaque	Acrylated UV Curable Epoxy, Polyester, Urethane
Vinegar	5	5	5
Lemon Juice	5	5	5
Orange Juice	5	5	5
Catsup	5	5	5
Coffee	5	5	5
Olive Oil	5	5	5
Boiling Water	5	5	5
Cold Water	5	5	5
Nail Polish Remover	3	2	5
Household Ammonia	5	2	5
VM&P Naphtha	5	5	5
Isopropyl Alcohol	5	5	5
Wine	5	5	5
Windex™	5	4	4
409 Cleaner™	5	5	5
Lysol™	5	5	5
33% Sulfuric Acid	5	5	5
77% Sulfuric Acid	5	4	3
28% Ammonium Hydroxide	5	1	5
Gasoline	5	5	5
Murphy's Oil Soap™	5	5	5
Vodka 100 Proof	5	5	5
1% Detergent	5	5	5
10% TSP	5	5	5
TOTAL	118	108	117
Wear Index	4	3	5
Cold Check	5	5	5
Adhesion	5	5	5
SCORE	132	121	132

For many product manufactures, finish chemistry listed here as *specialty* coatings may be standard operating practice. It is vital that the specifier not confuse high performing specialty finishes with those commonly available at the custom woodworking plant. Too often, specifications call for finishes based on samples or guide language from a specialty manufacturer. Consult AWI or AWMAC before specifying if there is any doubt.

Examples include the over-specification of polyurethane or polyester top coats when they are neither necessary or available from the custom fabricator.

There are a variety of ways to cure a finish. For the most part the method should not concern the design professional or specification writer. It is the *performance* of the top coat which is important. Select the performance criteria which best meets the needs of your client from the finish tables. Finish chemistry, performance, value-to-performance ratio, and your finisher's abilities should be considered.

UV (ultraviolet light) curing is one of the methods for curing topcoats. It is typically used for high volume, repetitive applications, and requires special reactors to cure. It is currently done by a limited number of finishing operations. The process is environmentally friendly. A number of prefinished panel products are coated with materials designed specifically for UV curing. While UV cured top coats are not all alike, most are very high performance finishes. Consult with the fabricator for performance tests and details.

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Color “Match” and Consistency

The term “color match” is often misleading. The best case achievable using a natural product like wood in a wide variety of lighting conditions is a good “blend” of color and tone throughout the project area. The natural color of the wood product is altered by the application of even a *clear* topcoat. Further alteration is achieved through the use of stains, glazes, bleaches, etc. All wood changes color; especially Cherry, Fir, genuine and African Mahogany, Walnut, Teak, and others. Filled nail holes will not change with wood. The apparent consistency of the color is a combination of light reflectance, cellular structure, natural characteristics, applied colors, and sheen.

Color and “matching” of a sample are often highly subjective. Individual perception, ambient lighting, and reflectivity influence judgement. Design professionals are encouraged to consult directly with a woodworker during the design and selection phase of each project.

1500-G-9

Factory Finish Materials

All factory finish systems utilize top coats with spray or flat line application that air dry within one hour, as is common practice, with the exception of waterborne polyesters, and two-component urethanes which may extend these time limits but will be dust free within 24 hours. Finishing materials will be selected for chemical compatibility with each other and with the substrate by the finishing professional.

Many prefinished real wood panels and decorative overlays have aesthetic and performance characteristics which meet or exceed these standards, and should be evaluated, approved and specified by the design professional when desired.

1500-G-10

Veneer Finishing

Observations and Considerations

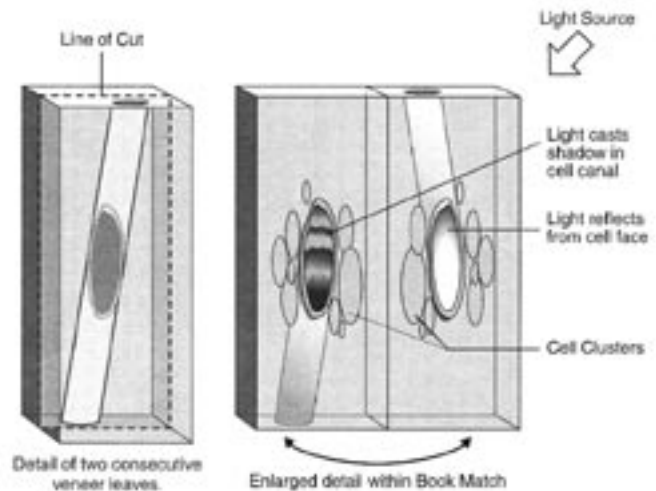
The fundamental construction of flush wood doors and hardwood veneered panel products is very similar. Both products use various substrates, or plys, with a top ply of hardwood veneer. As a result the following observations and considerations apply equally to flush wood doors and hardwood veneered panel product

Blotchy appearance of the finished surface

Blotching occurs because some wood species exhibit an uneven distribution of large and small pores in their structure. The occurrence of this is readily apparent in such hardwood species as Maple and Birch and, to a lesser degree, in Cherry. This irregular distribution of pores usually causes an uneven absorption of stain, hence, an apparent blotchy appearance in the finish. Reduction of the blotching condition can sometimes be achieved by proper sanding, wash coating (prior to staining) or by choosing non-penetrating pigments, such as dyes, alcohol stains or glaze. When these steps are required or desired, they shall be specified in addition to finish system selection.

Barber Pole, or Candy Stripping

This effect is most evident when veneer leaves are book matched. Because book matched veneer panel or door faces are made up by turning every other piece (leaf) of veneer over, like the pages of a book, the face of one leaf and the back of the next leaf is exposed. This exposes the “tight” and “loose” face of the leaves. One of the most striking examples of Barber Pole effect can be seen in book matched rift and quarter cut oak. Check with your woodworker when you are considering specifying rift or quartered veneers.



Techniques to Consider

While a blotchy appearance and the “barber pole effect” may occur in any species, due to the natural characteristics of wood, there are steps that can be taken to reduce these effects. The following are two of the techniques that are of particular importance.

Sanding

While the selection of species, cut and match are major factors in the final appearance of any project, the first step, in controlling the quality of finished appearance, is proper sanding.

An important element of this standard is the statement “just prior to staining”. Specifications that indicate, *factory shall finish sand prior to shipment*, do not provide a correct solution for proper surface preparation. Such a directive fails to take into account the length of time panels will be stored at the job site, potential damage from handling and the effects of changes in the relative humidity. Proper sanding can only be done, just prior to staining/finishing.

The successful sanding of panels, or flush doors, is best accomplished with a hand block, powered pad sander, wide belt sander or stroke sander, exerting uniform pressure over the entire surface. Depending upon the condition of the surface it may be necessary to use successively finer grits of abrasive to properly prepare the surface, brushing off the surface between grits. This standard sets forth the smoothness requirement for all Grades of work. Proper and complete surface preparation is the key factor in the successful finish procedure.

Wash Coat

A washcoat is a thin coat of material usually clear lacquer or vinyl sealer (6 to 10 parts thinner to one part sealer, topcoat). A washcoat can fulfill several purposes such as: to stiffen the small wood fibers that are raised by the staining operation, so they can be cut off easily with fine sand paper (320 grit), to seal the stain particularly if it is a bleeding type, to aid in the wiping and clean up of filler, and to minimize excessive penetration of stain or filler to minimize blotchiness. As with any finish process samples should always be prepared to ensure that the desired finish is achieved.

Blue Stain

Blue stain occurs in Oak veneers when natural tannic acid in the wood comes in contact with iron and or moisture. Enough moisture may occur during heavy rains or high humidity in buildings not yet temperature controlled. The following is from a door manufacturer's care and handling brochure.

"To prevent blue stain, never use steel wool on the bare wood. Fine particles of the wool will cling to the door and cause trouble later. If you use shellac (a solvent for iron), it should not be stored in iron containers. To remove blue stain prior to finishing doors, we recommend a solution oxalic acid crystals. The solution is made by dissolving 12 ounces of crystals in one gallon of lukewarm water. Use a plastic or rubber container. Wear rubber gloves while working with the solution. Apply it to the stained areas with a brush or sponge; allow the door to dry and sand with 150 to 180 grit sandpaper. The entire door surface should be treated to avoid spotting. Important: Failure to rinse the treated area adequately may have a damaging effect on the finish subsequently applied, or may cause damage to nearby glass, porcelain or other surfaces in confined areas. Damage may not result immediately, but may result during storage or after installation."

1500-G-11

Fire-Retardant-Treated Lumber and Coatings

Fire retardant treatments may affect the finishes intended to be used on the wood, particularly if transparent finishes are planned. The compatibility of any finishes should be tested before they are applied.

"Fire-retardant" coatings usually are of the intumescent type. They may be water-based or solvent-based, but both contain ingredients which, under the influence of heat, produce gases and char-like products, resulting in the formation of a thick nonflammable crust that effectively insulates combustible substrates from heat and flame. However, these ingredients are for the most part water-sensitive and therefore reduce durability and range of usage of the coatings.

These coatings only delay the spread of fire and help contain it to its origin. To be of any appreciable value, fire-retardant coatings must be applied in strict conformance with the manufacturers instructions. These finishes are not particularly durable and their use should be restricted to application over interior surfaces.

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The need for, and effectiveness of, fire-retardant and fire-resistant finishes depends on the type of construction, nature of occupancy, and other technical features of the building. Because these finishes are considerably more expensive and have reduced durability, their use should be carefully limited to those areas where confining fire spread is the overwhelming consideration; for example, interior entrances, hallways, stairwells and ceilings.

1500-G-12

Stripping Recommendation (when specified)



Note: While this section does not cover the removal of existing finishes on woodwork, the methods and skill involved in large measure determines the quality of preservation, conservation, and restoration during Historical Work. Stripping is usually performed by specialists trained in historic work, but there are some architectural woodworkers who have such specialists on the staff. Regardless of the assignment of responsibility for existing finish removal, the following guidelines should be inserted in the contract documents by the design team:

- Strippers shall be environmentally sound, solvent based. Alkaline based products are not acceptable. All strippers shall be neutral based, not requiring additional neutralization treatment.
- Before stripping begins all surfaces shall be tested (with the process and results recorded) to provide the least intrusive and damaging methods. Approval of the architect, design professional or conservator is required before execution of the work.
- Completely remove existing finish using multiple applications of the approved methods without gouging, splintering or otherwise damaging sound surfaces.
- Thoroughly remove all stripping residuals, include wax, before proceeding.
- Stripped surfaces shall be tested for evidence of acid or alkali, reworking the surface until it tests pH neutral.
- Carefully sand all surfaces by hand with no coarser than 220 grit garnet or aluminum oxide sandpaper to remove all signs of raised grain.



Technical Criteria

In the absence of specifications to the contrary, the following standards shall apply.

1500-T-1

Selection and Sample Submission

The selection of a finishing system does not establish the final color, sheen, or grain texture (i.e., open grain vs. filled grain). The design professional shall make a selection from the woodworker's standard finish samples for stain and/or fillers. If the project requires matching of a specific finish, the design professional shall provide the woodworker with a finish sample (minimum 80 square inches) which exhibits the final color, sheen, and grain texture desired.



Note: During pricing of the project, if a sample is not available, or if the exact finish procedure is not clearly defined in the project specification, then the customer shall expect that the woodworker will require an addition to the contract for the development and furnishing of a custom finish.

It is critical to understand that solid lumber and veneer of the same species and cut will finish differently. This fact is particularly evident when a clear finish is specified. Specifying a stain finish offers the opportunity to ameliorate some of the color differences that occur naturally, in various cuts, of the same species of wood.

Finish samples shall be submitted by the woodwork manufacturer for approval showing the complete finish appearance. Minimum sample sizes shall be as follows:

Veneered products – 200 x 250 x 6 mm [8 x 10 x 1/4"]

Solid Lumber - 300 square cm [50 square inches]

Sample Labels - The sample shall bear identification of the project, architect or designer, general contractor, woodwork manufacturer, items to which the finish applies and the system utilized to attain the finish.

Finishing sample panels shall be selected to show the natural variation of the natural solid or veneer wood color. For wood species or finish method(s) in which color variations are inevitable, the woodworker may elect to submit samples in sets of two or more, illustrating the possible range of these variations.

Sample Approval and Protection - Approved finish samples shall become the final criteria for evaluating color and appearance conformity at the time of delivery. Therefore, finish samples must be covered and protected from light. Sunlight and some artificial lighting will cause changes in the wood. No wood, wood finish, or stain is completely *colorfast* if that is defined as "no change of color over time." Raw wood, without a stain or finish, will change color in reaction to air and ambient conditions. The addition of stains and/or topcoats will change the rate at which the transformation will occur, but will seldom stop it.

1500-T-2

Both System and Grade Must be Specified

The specifier must select a finishing system and request either Premium, Custom, or Economy Grade. When specifying, please use the *system name* as set forth in this edition. Because finishing systems are changing so rapidly, we have discontinued the use of system numbers. Processes required for each Grade are shown later in this section.

Premium Grade

The Grade specified when the highest degree of control over the quality of workmanship, materials, installation and execution of the design intent is required. Usually reserved for special projects, or feature areas within a project.

Custom Grade

The Grade specified for most conventional architectural woodwork. This Grade provides a well defined degree of control over the quality of workmanship, materials and installation of a project. The vast majority of all work produced is Custom Grade.

Economy Grade

The Grade which defines the minimum expectation of quality, workmanship, materials, and installation within the scope of the Standards.

Prevailing Grade

When the Quality Standards are referenced as a part of the contract documents and no Grade is specified, Custom Grade standards shall prevail. In the absence of specifications, material shall be mill option lumber or veneers suitable for opaque finish. Prevailing factory finish shall be one coat clear sealer selected by the woodwork manufacturer.

Generally, the finishing Grade selected will be the same as the fabrication Grade of the product. However, there may be a case where the performance characteristics might require a higher Grade for the finish than that which was specified for the fabrication. An example would be the fabrication of school laboratory casework under Custom Grade, and by virtue of its exposure to harsh chemicals the selection of a Premium Grade finish.

These standards do not attempt to identify all finishing systems. The design professional is free to request any finishing system desired for the project. In this instance, the system and its components must be fully described in the specifications.

1500-T-3

Competence

Not all woodwork manufacturers have finishing facilities. They customarily contract the work to a dedicated finishing firm. The woodwork manufacturer or dedicated factory finisher shall, if requested, provide evidence of adequate facilities, equipment, and personnel to execute factory finishing responsibilities.

1500-T-4

Definition of Casework Areas

Determination as to what portions of casework shall be Exposed, Semi-exposed, and Concealed shall be the same as defined in Casework Section 400 except that, for the purpose of factory finishing, both sides of cabinet doors shall be considered *Exposed*.

1500-T-5

Architectural Wood Door Criteria

Doors shall be sealed and/or finished top and bottom if required per manufacturers standard warranty. For appearance, doors may be specified to be finished on the top with care taken to preserve manufacturers warranty information.

1500-T-6

Field Touch-up

Field touch-up shall be the responsibility of the installing contractor, and shall include the filling and touch-up of exposed job-made nail or screw holes, refinishing of raw surfaces resulting from job fitting, repair of job inflicted scratches and mars, and final cleaning of the finished surfaces. Field touch-up generally takes the form of wax stick fillers or burn-in techniques. The prefinisher may be contracted to supply touch-up materials by special arrangement and agreement between the finisher and the general contractor.

1500-T-7

Fire-Retardant, -Resistant Coatings

Subject to local codes, the use of fire-rated substrates in lieu of fire-retardant coatings is recommended.

It shall be the direct responsibility of the owner or design professional to indicate when woodwork is to receive this substrate or finish, who is designated to provide or apply it, and what particular finish is required by manufacturer and brand name.

1500-T-8

Finishing of Concealed Areas and Back Priming

Factory-finished mouldings shall be back-primed with one coat of sealer or primer.

Concealed portions of Premium Grade (only) factory-finished casework shall be finished with one coat of sealer or primer.

Concealed portions of factory-finished paneling shall be finished with two coats of sealer or primer.

Back priming is required prior to installation of any factory finished woodwork over concrete or masonry partitions and strongly recommended, but not required, in all other instances.

1500-T-9

Finish System Performance Table

This table summarizes the relative performance characteristics of the Standard and Specialty finishing systems. The comparisons are based on generic qualities of the best materials available from reputable suppliers. The information and ratings stated here are believed to be reliable. Due to variations in handling and methods not known or under our control, this Standard cannot make any warranties or guarantees as to end result or suitability for use. Other formulations may exhibit the same performance characteristics as the systems described in this Section. Sheen shall be specified and evaluated on finish samples.

When specifying for compliance with these Standards, the specifying shall use the *system name* as set forth in this edition. **Because finishing systems are changing so rapidly, we have discontinued the use of system numbers.** Involve your manufacturer early in the design process to evaluate the systems in relation to your project requirements. Choose performance characteristics which meet but do not exceed the needs of your project in the interest of best practice and value engineering.

Performance Table for Sprayable Finish Systems

System	Score*	Why and Why Not
Standard production finishes (commonly available)		
Conversion Varnish	126-129	Why: Durable; widely available; good build Why not: Occasional lack of finish clarity
Post-catalyzed Lacquer	119	Why: Repairable; finish clarity; stain, heat, abrasion, chemical resistance Why not: Some yellowing; moderate build
Pre-catalyzed Lacquer	114	Why: Repairable; stain, abrasion, chemical resistance Why not: Yellowing; moderate build
CAB & Water Acrylic Lacquer	109-116	Why: Low VOCs; finish clarity (some formulations); stain resistance; yellowing resistance Why not: Low durability; solvent and heat resistance; slow drying time
Nitrocellulose Lacquer	107-108	Why: Repairable; widely available; quick drying Why not: Lack of durability and resistance to most solvents and water; yellows over time
Specialty finishes (specify after consultation)		
Acrylated UV Curable Epoxy, Polyester, or Urethane	132	Why: Low VOCs; durable; near 100% solids usage; quick drying (cure) Why not: Difficult to repair, requires specialized curing reactors; availability varies
Catalyzed Polyurethane	130-131	Why: Durable; good build Why not: Slow drying, very difficult to repair, some formulations hazardous to spray personnel without air make-up suits
Catalyzed Vinyl	125	Why: Durable; widely available; fast drying Why not: Occasional lack of finish clarity
Polyester	121-132	Why: Durable; good build; can be polished Why not: Not widely available; slow curing; requires special facilities and skills; very difficult to repair; brittle finish flexibility
Penetrating Oil	87	Why: Close-to-wood, antique look; low sheen Why not: Labor intensive to apply and maintain, refreshing finish from time to time required; low resistance properties to most substances

* The Scores are the ranges from the Quick Usage Guide to Factory Finishes in this standard. When the difference between two systems is 10 points or less, it is likely that the lower scoring system will serve your customer's needs as well as the higher. Many times a lower scoring system will be less expensive than a higher scoring one, but that is *not* always the case. Consult with your AWI/AWMAC finisher.



Cautions

- The listing of a finish system in this book does not imply an endorsement of the materials and/or methods or compliance with Federal and/or Local Environmental Protection Agency or other requirements.
- When properly applied, the systems recommended in the tables will perform well under normal use. No wood or finish system will perform well when abused.
- Some finishing professionals have found polyurethanes and/or polyesters impractical to spray in environmentally sound conditions, rendering them unworkable for a quantity of laboratory casework, for example. In cases like these, catalyzed vinyl shall be the topcoat of choice.

1500-T-13

Workmanship

Regardless of the smoothness criteria established elsewhere in the fabrication sections of this standard, final sanding prior to application of finishing materials of any kind shall be the responsibility of the finisher.

Workmanship Finish Condition	Premium		Custom		Economy	
	Transparent	Opaque	Transparent	Opaque	Transparent	Opaque
Handling marks	Removed		Removed		Removed	
Cross scratches	None greater than smoothness of exposed surface table for Item ¹		None greater than smoothness of exposed surface table for Item ¹		None greater than smoothness of exposed surface table for Item ¹	
Effects of exposure to moisture (grain raise, etc.)	Removed		Removed		Removed	
Indentation and scrapes	Steamed and resanded		Steamed and resanded	Filled and resanded	Filled or patched and resanded	
Adhesive lines	Colored to blend and inconspicuous beyond 915 mm [3'] ²		Colored to blend and inconspicuous beyond 1830 mm [6'] ²		Inconspicuous beyond 2745 mm [9'] ²	
Glue bleed through	Not permitted	Sand smooth	Not permitted	Sand smooth	Not permitted	Mill option
Machining or tool marks	Removed unless part of the design aesthetic		Removed unless part of the design aesthetic		Inconspicuous beyond 2745 mm [9']	
Particulates and dust	Removed after each sanding step is completed		Removed after each sanding step is completed		Removed after each sanding step is completed	
Joint conditions	Comply with Section Std. ¹		Comply with Section Std. ¹		Comply with Section Std. ¹	
Flushness conditions						
Paste Filler	Only when specified in contract documents prior to bid or tender					
¹ See the citation in the specific section of the Standards under which the item was fabricated.						
² This criteria applies after full stain and finish system is in place, but the condition must be tested prior to finishing and corrected to this criteria when out of compliance.						

1500-T-14

Finish System Standards

In the absence of clear, detailed specifications, woodworkers will furnish factory finishing according to the following minimum standards for each system. The events are listed in the approximate order of occurrence. Some factories may modify these events while meeting the performance criteria for the selected system. **The application of washcoat, filler and/or stain is included only when specified.** The specification of a finish system from this Standard alone does not imply staining, washcoats, fillers, glazes, etc. "Natural" or "Transparent" finish specifications alone do not imply staining, filling or coloration of any type.

Light sanding between the first and second topcoat is recommended by many finish material suppliers. Some finishes fail due to the application of too much finish. Comply with material supplier's directions for application of selected or specified materials. These Standards do not attempt to identify all finishing systems. The design professional is free to request any finishing system desired for the project. In this instance, the system and its components must be fully described in the specifications.

Standard Production Finishes

Finish System - Nitrocellulose Lacquer			
	Premium	Custom	Economy
Close Grain Woods	[Vinyl washcoat] [Stain] Vinyl sealer Sand (220 grit) Top coat Top coat	[Nitrocellulose washcoat] [Stain] Nitrocellulose sealer Sand (220 grit) Top coat Top coat	[Nitrocellulose washcoat] [Stain] Nitrocellulose sealer Sand (220 grit) Top coat
Open Grain Woods	[Stain] Vinyl sealer Sand (220 grit) Top coat Top coat	[Stain] Nitrocellulose sealer Sand (220 grit) Top coat Top coat	[Stain] Nitrocellulose sealer Sand (220 grit) Top coat
Open Grain Woods (filled finish - usually reserved for horizontal surfaces - must be specified)	[Stain] [Vinyl washcoat] [Filler] Vinyl sealer Sand (220 grit) Top coat Top coat	[Stain] [Nitrocellulose washcoat] [Filler] Nitrocellulose sealer Sand (220 grit) Top coat Top coat	Not applicable
Items in [brackets] must be requested & specified separately, or are not included.			

Finish System - Catalyzed Lacquer			
	Premium	Custom	Economy
Close Grain Woods	[Vinyl washcoat] [Stain] Vinyl sealer Sand (220 grit) Top coat Top coat	[Vinyl washcoat] [Stain] Vinyl sealer Sand (220 grit) Top coat Top coat	[Vinyl washcoat] [Stain] Vinyl sealer Sand (220 grit) Top coat
Open Grain Woods	[Stain] Vinyl sealer Sand (220 grit) Top coat Top coat	[Stain] Vinyl sealer Sand (220 grit) Top coat Top coat	[Stain] Vinyl sealer Sand (220 grit) Top coat
Open Grain Woods (filled finish - usually reserved for horizontal surfaces - must be specified)	[Stain] [Vinyl washcoat] [Filler] Vinyl sealer Sand (220 grit) Top coat Top coat	[Stain] [Vinyl washcoat] [Filler] Vinyl sealer Sand (220 grit) Top coat Top coat	Not applicable
Items in [brackets] must be requested & specified separately, or are not included.			

Standard Production Finishes (continued)

Finish System - Acrylic Lacquer			
	Premium	Custom	Economy
Close Grain Woods	[Stain] CAB sealer Sand (220 grit) Cellulose Acetate Butyrate Lacquer Cellulose Acetate Butyrate Lacquer	[Stain] Water reduced sealer Sand (220 grit) Water Reducible Acrylic Lacquer Water Reducible Acrylic Lacquer	[Stain] Water reduced sealer Sand (220 grit) Water Reducible Acrylic Lacquer
Open grain woods	[Stain] CAB sealer Sand (220 grit) Cellulose Acetate Butyrate Lacquer Cellulose Acetate Butyrate Lacquer	[Stain] Water reduced sealer Sand (220 grit) Water Reducible Acrylic Lacquer Water Reducible Acrylic Lacquer	[Stain] Water reduced sealer Sand (220 grit) Water Reducible Acrylic Lacquer
Items in [brackets] must be requested & specified separately, or are not included.			
Finish System - Acrylic Latex			
	Premium	Custom	Economy
Close Grain Woods	[Stain] Water reduced sealer Sand (220 grit) Water Reducible Acrylic Latex Water Reducible Acrylic Latex	[Stain] Water reduced sealer Sand (220 grit) Water Reducible Acrylic Latex Water Reducible Acrylic Latex	[Stain] Water reduced sealer Sand (220 grit) Water Reducible Acrylic Latex
Open grain woods	[Stain] Water reduced sealer Sand (220 grit) Water Reducible Acrylic Latex Water Reducible Acrylic Latex	[Stain] Water reduced sealer Sand (220 grit) Water Reducible Acrylic Latex Water Reducible Acrylic Latex	[Stain] Water reduced sealer Sand (220 grit) Water Reducible Acrylic Latex
Items in [brackets] must be requested & specified separately, or are not included.			

Standard Production Finishes (continued.)

Finish System - Conversion Varnish			
	Premium	Custom	Economy
Close Grain Woods	[Vinyl washcoat] [Stain] Vinyl sealer Sand (220 grit) Top coat Top coat	[Washcoat (conversion varnish reduced)] [Stain] Sealer (conversion varnish reduced) Sand (220 grit) Top coat Top coat	[Washcoat (conversion varnish reduced)] [Stain] Sealer (conversion varnish reduced) Sand (220 grit) Top coat
Open Grain Woods	[Stain] Vinyl sealer Sand (220 grit) Top coat Top coat	[Stain] Sealer (conversion varnish reduced) Sand (220 grit) Top coat Top coat	[Stain] Sealer (conversion varnish reduced) Sand (220 grit) Top coat
Open Grain Woods (filled finish - usually reserved for horizontal surfaces - must be specified)	[Stain] [Vinyl washcoat] [Filler] Vinyl sealer Sand (220 grit) Top coat Top coat	[Stain] [Washcoat (conversion varnish reduced)] [Filler] Sealer (conversion varnish reduced) Sand (220 grit) Top coat Top coat	Not applicable
Items in [brackets] must be requested & specified separately, or are not included.			

Specialty Finishes (Specify only after consultation)

Finish System - Synthetic Penetrating Oil and Simulated Oil Finish			
	Premium	Custom	Economy
Close Grain Woods	[Simulated Oil Finish] Penetrating Oil Catalyzed vinyl sealer (close-to-wood look) Scuff sand (320 grit) Catalyzed vinyl top coat (close-to-wood look)	Penetrating oil Brass wool rubdown Penetrating oil Wax	Penetrating oil Wax
Open Grain Woods	[Simulated Oil Finish] Penetrating Oil Catalyzed vinyl sealer (close-to-wood look) Scuff sand (320 grit) Catalyzed vinyl top coat (close-to-wood look)	Penetrating oil Brass wool rubdown Penetrating oil Wax	Penetrating oil Wax

Items in [brackets] must be requested & specified separately, or are not included.

Finish System - Catalyzed Vinyl (Premium recommended for laboratory finish)			
	Premium	Custom	Economy
Close Grain Woods	[Vinyl washcoat] [Stain] Catalyzed vinyl sealer Sand (220 grit) Top coat Top coat	[Vinyl washcoat] [Stain] Vinyl sealer Sand (220 grit) Top coat Top coat	[Vinyl washcoat] [Stain] Vinyl sealer Sand (220 grit) Top coat
Open Grain Woods	[Stain] Catalyzed vinyl sealer Sand (220 grit) Top coat Top coat	[Stain] Vinyl sealer Sand (220 grit) Top coat Top coat	[Stain] Vinyl sealer Sand (220 grit) Top coat
Open Grain Woods (filled finish - usually reserved for horizontal surfaces - must be specified)	[Stain] [Catalyzed vinyl washcoat] [Filler] Catalyzed vinyl sealer Sand (220 grit) Top coat Top coat	[Stain] [Vinyl washcoat] [Filler] Vinyl sealer Sand (220 grit) Top coat Top coat	Not applicable

Items in [brackets] must be requested & specified separately, or are not included.

Specialty Finishes (Specify only after consultation)

Finish System - Catalyzed Polyurethane			
	Premium	Custom	Economy
Close Grain Woods	[Washcoat (reduced vinyl sealer)] [Stain] Vinyl sealer Sand (220 grit) Top coat Top coat	[Washcoat (reduced vinyl sealer)] [Stain] Vinyl sealer Sand (220 grit) Top coat	[Washcoat (reduced vinyl sealer)] [Stain] Vinyl sealer Sand (220 grit) Top coat
Open Grain Woods	[Stain] Vinyl sealer Sand (220 grit) Top coat Top coat	[Stain] Vinyl sealer Sand (220 grit) Top coat	[Stain] Vinyl sealer Sand (220 grit) Top coat
Open Grain Woods (filled finish - usually reserved for horizontal surfaces - must be specified)	[Stain] [Washcoat (reduced vinyl sealer)] [Filler] Vinyl sealer Sand (220 grit) Top coat Top coat	[Stain] [Washcoat (reduced vinyl sealer)] [Filler] Vinyl sealer Sand (220 grit) Top coat	Not applicable
NOTE: For all Grades and effects, washcoats and sealers compatible to the top coats must be used.			
Items in [brackets] must be requested & specified separately, or are not included.			

Finish System - Two Component Polyester			
	Premium	Custom	Economy
Close Grain Woods (filled finish)	[Stain (compatible)] Polyester sealer Polyester sealer Sand (180 grit) Polyester clear top coat Full mechanical rub and polish all exposed surfaces	Not applicable	Not applicable
Open Grain Woods (filled finish - usually reserved for horizontal surfaces - must be specified)	[Stain (compatible)] Polyester sealer Polyester sealer Sand (180 grit) Polyester clear top coat Full mechanical rub and polish all exposed surfaces	Not applicable	Not applicable
Acrylated UV curable Epoxy, Polyester, or Urethane	[Stain (compatible)] Consult with your AWI or AWMAC finisher for availability and specific finish criteria and performance. May not be available for all Grades of work or in all areas.		
Items in [brackets] must be requested & specified separately, or are not included.			

1500

1500-T-15

Treatment of Sapwood

In the absence of specifications, the following standards will apply. Where more than one method or material is listed for a grade, manufacturers will supply their choice from the alternatives.

Sapwood Table	Premium	Custom	Economy
Finish of Exposed Surfaces	Sapwood must be blended in the final finish appearance	Sapwood must be blended in the final finish appearance	Blending not required
Finish of Semi-exposed Surfaces	Blending not required		

1500-T-16

Semi-exposed Surface System Standard

Semi-exposed Table	Premium	Custom	Economy
*Transparent Finish (for cabinets with transparent or opaque finished wood exterior)	[Stain] Sealer Sand Top coat	Sealer Sand Top coat	Sealer Sand
*Opaque Finish (for cabinets with transparent or opaque finished wood exterior)	Primer-surfacer Sand Top coat	Primer-surfacer Sand Top coat	Primer-surfacer Sand
Alternate Finish Materials [by direct specification only in Premium Grade Trans. finish]	Modern casework is often manufactured with Thermoset Decorative Laminate materials for interior (semi-exposed) surfaces. These materials are often cost-effective, durable interior finish solutions. Consult your AWI/AWMAC woodwork manufacturer during the design phase for engineering assistance.		
* Not applicable to cabinets with HPDL exteriors. See Caution note on this page and elsewhere in this standard.			
Items in [brackets] must be requested & specified separately, or are not included.			



Caution

Special consideration shall be given to raw wood parts on high pressure decorative laminate-clad (HPDL) assemblies including, but not limited to, wood pulls, wood trims, applied mouldings, banding, drawer bodies, and wood cabinet interiors. Factory finishing of these and similar parts is not included unless specified in the Contract Documents pertaining to the fabrication of the HPDL work. Specifications regarding the responsibility for finishing (if any) shall be clarified by the design professional.

1500-T-17

Primer for Final Paint Finish

Economy Grade – one coat any commercial primer, no sanding.

Custom Grade – one coat any commercial primer at 1 mil dry, sanded to 120.

Premium Grade – two coats any commercial primer at 2 mils dry total, sanded to 120 after final coat of primer.



Compliance Criteria

1500-C-1

Visual Tests Applicable to Exposed Surfaces

It is important to view finished surfaces in the ambient conditions in which they will be installed and used. The perception of color varies with the light source and between individuals. The following tests apply to new work at the time of installation, and shall not be applied to refinishing conditions except as agreed in advance between buyer and seller.

Surface Condition	Premium	Custom	Economy
Finish sanding scratches	Not permitted	Inconspicuous beyond 915 mm [3']	Inconspicuous beyond 1830 mm [6']
Orange peel (slight depressions in surface, similar to the skin of an orange)	Not permitted	Inconspicuous beyond 915 mm [3']	Inconspicuous beyond 1830 mm [6']
Runs (running of wet finish film in rivulets)	Not permitted	Not permitted	Inconspicuous beyond 915 mm [3']
Sags (partial slipping of finish film creating a curtain effect)	Not permitted	Inconspicuous beyond 915 mm [3']	Inconspicuous beyond 1830 mm [6']
Blistering (small, swelled areas like water blisters on human skin)	Not permitted	Not permitted	Inconspicuous beyond 915 mm [3']
Blushing (whitish haze, cloudy)	Not permitted	Not permitted	Inconspicuous beyond 915 mm [3']
Checking, crazing (crowfeet separation or irregular line separation)	Not permitted	Not permitted	Inconspicuous beyond 915 mm [3']
Cracking (formation like dried mud)	Not permitted	Not permitted	Inconspicuous beyond 915 mm [3']
Glue spots	Not permitted	Not permitted	Inconspicuous beyond 915 mm [3']
Filled nail holes	Inconspicuous beyond 915 mm [3']	Inconspicuous beyond 1830 mm [6']	Inconspicuous beyond 2745 mm [9']
Field repairs and touch-ups	Inconspicuous beyond 915 mm [3']	Inconspicuous beyond 1830 mm [6']	Inconspicuous beyond 2745 mm [9']

1500-C-2

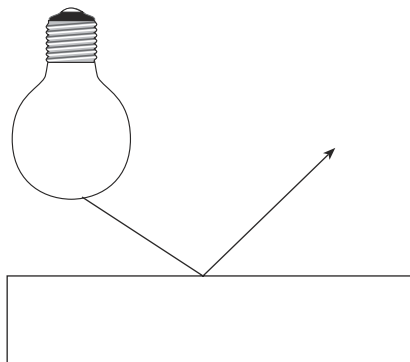
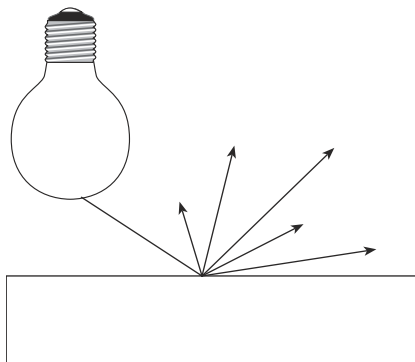
Consistency of Grain and Color Tests

Compliance with standards for color and grain are highly subjective. Each person's perception of color is unique. The apparent color of a finished wood species is affected by many variables. Among the variables are: ambient lighting, cellular structure of the individual piece of wood, cutting or slicing of the wood, machining and sanding of the surface, and orientation of the surface to the viewer. Evaluation of compliance shall be based upon meeting *all* the following conditions:

1. Viewing of the surfaces in the lighting and orientation in which they will be installed;
2. Comparison of the surfaces with approved range of sample panels, signed and dated, protected from light;
3. Sample panels each large enough to be representative, 200 x 250 mm [8 x 10"] minimum;
4. Color and tone blending with the range of sample panels, that is not significantly lighter than the lightest of the range, nor darker than the darkest of the range, for example.

Transparent Systems – Opaque Systems

It is recognized that wood is a natural product and will not take color and/or finish as consistently for transparent finishes as it will for opaque finishes.



A satin finish will deflect direct light (left). A highly buffed gloss finish will reflect it (right).

Satin finishes are more forgiving of the natural characteristics in wood and usually easier to care for by the client.

1500-C-3

Sheen Tests

Sheen is listed in point ranges, which may vary by coating supplier, and by species of wood and the way it takes the topcoat. Typically as range of 20 points is difficult to detect on installed woodwork. Sheen listed here are as tested by a 60-degree gloss meter.

Flat = 15 to 30

Satin = 31 to 45

Semigloss = 46 to 60

Gloss = 61 or greater

Evaluation of compliance shall be based upon meeting *all* the following conditions:

1. Testing of the surfaces with a gloss meter in identical lighting conditions;
2. Comparison of the surfaces with approved range of sample panels, signed and dated, protected from light;
3. Sample panels each large enough to be representative, 200 x 250 mm [8 x 10"] minimum;
4. When contract documents call for sheen using the terms Flat, Satin, Semigloss or Gloss, sheen results falling within the ranges listed above shall be considered in compliance. When comparisons of sheen tests between the approved and protected sample panels and the installed work show sheen readings outside the listed ranges, sheen results within 20 points of each other shall be considered to be in compliance.

1500-D-1

Glossary of Selected Terms

* = **Optional Step** in addition to application of sealer and specified topcoat(s).

Manufacturers have a variety of names for what are essentially the same type of product. While there will always be something new or different on the market, the following descriptions may help the reader understand some key terms of finishing.

Abrasion Resistance Resistance to friction wear.

Acrylic Lacquers A high-quality clear system for finishing furniture, cabinets and a wide variety of wood items. They are water white in color with excellent nonyellowing qualities. Available in both solvent-type and water-reducible products.

Adhesion The degree of attachment between a finish step and the underlying material.

Alkyd A type of synthetic resin used as the vehicle or modifier in coating, usually to increase such things as hardness, toughness, and flexibility.

***Aniline (Acid) Dyes** Synthetic colors which dissolve in the solvent for which they are formulated, i.e., water, alcohol, or oil. Many woodwork finishers refer to nearly all dyes as "aniline" even when this is not chemically true. NOTE Aniline (Acid) dye stains must be specified, and are always applied to the raw wood before sealing in any system.

Baking Drying a coating material by using artificial heat. Baking temperatures are usually in the 70-260 degrees Celsius [160-500 degrees Fahrenheit] range. Temperatures in the 38-66 degrees Celsius [100-150 degrees Fahrenheit] range would usually be referred to as force drying.

Barber Pole An effect in book matching of veneers resulting from tight and loose sides of veneers causing different light reflections when finished.

Binder The part of the vehicle which does not evaporate. It binds the pigment particles together and stays on the surface and forms the film of the finish.

***Bleaching** The chemical process used to remove color or whiten solid wood or wood veneered panels. This process may be used to lighten an extremely dark wood or to whiten a lighter colored wood. Most woods do not turn completely white when bleached.

Bleeding When the color of one coating material migrates up through the finishing layer to the succeeding coat imparting some of its characteristics.

Blistering Formation of bubbles on the surface of a coating. Caused by trapping air or vapors beneath the surface.

Bloom Bluish haze which forms on the surface of a paint film which affects the gloss.

Blushing The whitish, cloud like haze that occurs in fast-drying finishes, especially lacquer, when they are sprayed in very humid conditions. Blushing is most often due to moisture (water vapor) trapped in the film or to resin precipitating out of solution.

Brittleness The tendency of a dried paint or clear film to crack or flake when bent or scratched.

Catalyst Chemically, an ingredient added to a product to provide additional performance characteristics, such as faster drying, chemical resistance, or increased hardness of the finish.

Catalyzed Lacquer A modified nitrocellulose-based coating with a catalyst added for enhanced performance.

Catalyzed Vinyl A catalyzed coating with a vinyl resin base. Extremely tough and resistant to most chemicals.

Checking Wood or Veneer checking "Small slits running parallel to grain of wood, caused chiefly by strains produced in seasoning." OR Cold Checking "Cracks which appear in a paint film due to lack of cohesion. Often caused by too heavy a coat being applied or a poor grade of finish being used." Cold checking is often characterized by the appearance of small "fish hooks" at the ends of the cracks which may run perpendicular to the figure, while wood checking does not exhibit the "fish hooks" and runs parallel to the figure.

Conversion Varnish A catalyzed alkyd-based coating that is tough and resistant to household chemicals.

Cratering The formation of small depressions in a finish, sometimes called fish eye. Often caused by the contamination of the finish material or the substrate with silicone, oil, or other substances.

Crawling The tendency of a wet film to creep or crawl away from certain areas of a substrate. Very sharp corners or contamination is often the cause. See Cratering.

Curing The complete drying of a finish to the ultimate development of its properties.

Danish Oil The general name for any number of wipe-on coatings based on tung or linseed oil, with solvents and resins added to enhance both drying and performance.

***Distressing** May be either of a mechanical or chemical nature to give special effects.

***Paste Filler** Ground inert solids specifically designed to fill pores or small cavities in wood as one step in the overall finishing process in order to advance the final build and smoothness of the finish. Filler may be neutral or a contrasting color to accent the pores. The use of filler alone may not completely fill all pores.

The use of filler in the finishing process is generally limited to horizontal surfaces fabricated from ring-porous woods. Examples include table tops, reception surfaces, etc. Close Grain species seldom require filler. Few vertical surfaces benefit from the added labor of a filled finish. Application of additional sealer coats and/or top coats does not constitute a traditional *filled finish* and is not acceptable as such unless specified to be so.



Note: Open Grain and Close Grain

The size and distribution of the cellular structure of the wood influences the appearance and uniformity. Open Grain hardwoods, such as Elm, Oak, Ash, and Chestnut are "ring-porous" species. These species have distinct figure and grain patterns. Close Grain hardwoods, such as Cherry, Maple, Birch, and Yellow Poplar, are "diffuse-porous" species. Most North American diffuse-porous woods have small, dense pores resulting in less distinct figure and grain. Some tropical diffuse-porous species (e.g., Mahogany) have rather large pores.

***French Polish** Many coats of a mixture of shellac and alcohol rubbed on with a cloth pad, usually to a high sheen.

***Glazing** An added step for achieving color uniformity and depth, and for highlighting the wood's grain pattern. It is also used for tortoise shell, marble effect, or antiquing.

Gloss Meter An instrument for measuring reflected light from a finished surface to define sheen. Can be used at different angles of reflection, the most common of which are 20, 60, and 85 degrees.

***Hand-Rubbed Finish** The name given to an effect that is created by the manual process of applying a combination of abrasives and lubricants, after the final topcoat has dried, to smooth, flatten or dull the topcoat.

Hardness The property of a coating which causes it to resist denting or penetration by a hard object.

Humidity The common shorthand term for Relative Humidity, which is to say the amount of vaporized moisture in an atmosphere in relation to temperature.

Lacquer Materials which dry quickly by solvent evaporation. There are both natural and synthetic lacquers; both available transparent and pigmented.

Lifting Softening of a dried film by the solvents of a succeeding coat, which causes raising and wrinkling of the first coat.

Metamerism An apparent change in color when exposed to differing wavelengths of light; the human perception of color.

***Mirrored Polish Finish** Requires several steps of wet sanding, mechanical buffing, and polishing.

***NGR Stains** Non-grain-raising (NGR) stains are dye solutions that do not contain pigments. Spray application gives an overall transparent color to the wood, offering a high degree of clarity. Some fading may occur over time.

Nitrocellulose The basic ingredient of most common natural lacquers.

Orange Peel The description of a coating which does not flow out smoothly; exhibiting the texture of an orange.

Overspray The dry, pebble-like surface caused when sprayed finish begins to dry in the air before it hits the surface.

***Penetrating Dyes** Deep color, fast-drying stains often carried in solvents as a liquid or as a gel. Some water-soluble versions are available.

Penetrating Oil An oil-based material designed to penetrate into the wood. It usually requires reapplication from time to time

***Penetrating Oil Stains** Almost always a thin liquid mixture of oil and thinner with a dye added for color. May result in a blotchy appearance on Maple, Birch, Cherry, Pine, etc.

***Pickling** A white or light-colored pigment in either an oil or water vehicle. When wiped or brushed on to an open pore wood, the white stays in the pores and is usually wiped off the surface, either entirely or partially depending on the effect desired. Similar to the application of *Filler*.

***Pigmented Oil Stains** Almost always an oil-based liquid with pigments (not dyes) added.

Polyester A very high-solids-content coating consisting of two components that require special care in handling and spraying. Leaves a deep wet looking clear or colored finish. Limited repairability.

Polyurethane Usually a two-component system that may have a higher solids content than lacquers. Takes somewhat longer to dry than lacquer. A highly durable finish which, as a result, is very difficult to repair.

Runs The result of spraying a heavier coat on a vertical, or nearly vertical, surface than the viscosity of the finish will allow to hold without movement, when in close multiples are also called Sags.

Sealers Compounds that provide a sandable coating and a smooth surface for final topcoat application, provide system toughness and holdout, provide moisture resistance, and contribute to build and clarity.

***Shading** A technique that can be used to either highlight contrast, or create a more uniform appearance.

***Staining** One of the optional operations in wood finishing, producing the desired undertone color and complementing the wood with proper distribution of color, depth of color and clarity of grain. Selection of type of stain used is governed by desired aesthetic result.

Standard Lacquer A nitrocellulose-based coating, usually without any additives, that dries by solvent evaporation. Generally easy to repair.

***Toners** Transparent or semitransparent pigmented top coat used to even the color or tone of the wood.

Top Coat The final protective film of a finish system. There are various top coats with different properties.

UV Curing A method of curing specially formulated top coats as ultra violet light causes quick and complete cross linking of the material.

Vinyl Lacquers Catalyzed lacquers made with a vinyl resin rather than a nitrocellulose base.

Viscosity The property of a fluid which causes it to resist flowing. Measured at a certain temperature through a certain size opening or orifice.

***Washcoats** Thin solutions applied as a barrier coat to wood. They are used prior to wiping stains for color uniformity. Shellac washcoats help finish materials adhere to resin-secreting woods

***Water-Based Stains** Are made by adding hot water to universal tinting colors, then diluting that solution to the desired strength with cold water. They provide good grain clarity, but raise the grain and are slow to dry.

***Wiping Stains** Are thin pastes or thick liquids with pigment suspended in a solvent vehicle; applied and wiped with a cloth to remove excess stain.

Yellowing The yellowing effect is often a result of using amber binders or vehicles for the stains and/or topcoats. To avoid yellowing, specify "nonyellowing" finishing materials. The addition of an ultraviolet (UV) inhibitor will slow, but will not prevent, the gradual color change of the wood, the stain and the finish system.

*** = Optional Step** in addition to application of sealer and specified topcoat(s).

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