STAIRWORK AND RAILS

SECTION 800

Section 800 Selection and Specification Checklist

Because most architecture, specification, and design firms have electronic master specifications in place, the AWI and AWMAC offer this quick checklist. A review of these items may help the design and specification team issue a complete and accurate contract document and avoid missing things vital to the successful completion of the project. The checklists are not considered a part of the Quality Standards for the purposes of compliance.

Part 1. GENERAL

1.1. REFERENCES

A. AWI/AWMAC Quality Standards Illustrated (QSI), current edition

1.2. SUBMITTALS

A. Shop drawings:

• Submit two copies; one of which will be returned with reviewed notations prior to commencement of work under this section.

• Indicate plans and elevations, materials, surface grain directions, profiles, assembly methods, joint details, fastening methods, accessories, hardware, compliance with specified fire-retardant treatments, preservative treatments, and schedule of finishes.

B. Finish samples:

• When appropriate, submit one or more samples of veneer-on-substrate, 200 x 250 mm [8 x 10"] illustrating expected range of component finish color and/or grain.

• When appropriate, submit one or more samples of solid lumber, 300 square centimeters [50 square inches] illustrating expected range of component finish color and/or grain.

• 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.

1.3. QUALITY ASSURANCE

A. Perform work in accordance with [Premium] [Custom] [Economy] Grade quality

B. Work in this section shall comply with the specified Grade(s) of Work and Section (s) of the current edition of the AWI/AWMAC Quality Standards Illustrated.

1.4. QUALIFICATIONS

A. Contractors and their personnel engaged in the work shall be able to demonstrate successful experience with work of comparable extent, complexity and quality to that shown and specified.

B. Manufacturers who are members in good standing of the Architectural Woodwork Institute (AWI) or the Architectural Woodwork Manufacturers Association of Canada (AWMAC) and are familiar with this Standard.

1.5. DELIVERY, STORAGE AND HANDLING

A. Protect work from moisture damage according to QSI, Section 1700, Installation.

Part 2. PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers who are members in good standing of the Architectural Woodwork Institute (AWI) or the Architectural Woodwork Manufacturers Association of Canada (AWMAC) and are familiar with this Standard.

2.2. LUMBER

A. Softwood Lumber: If a particular species is desired, specify here.

• For exposed surfaces:

• For semi-exposed surfaces:

• For concealed surfaces:

B. Hardwood Lumber: If a particular species is desired, specify here.

• For exposed surfaces:

• For semi-exposed surfaces:

• For concealed surfaces:

2.3. PANEL PRODUCTS

A. Softwood plywood: Not usually used for in fine architectural woodwork, but specify here if part of the design æsthetic.

- For exposed surfaces:
- For semi-exposed surfaces:
- For concealed surfaces:

B. Hardwood plywood: Made with medium density particleboard or fiberboard (MDF) core for interior use or moisture-resistant core stock for exterior use; specify face veneer species here.

- For exposed surfaces:
- For semi-exposed surfaces:
- For concealed surfaces:

C. High-pressure decorative laminate (HPDL), specify by brand name and design name/part number.

- For exposed surfaces:
- For semi-exposed surfaces:

D. Core material for veneered or laminated components, if other than QSI standards:

- For exposed surfaces:
- For semi-exposed surfaces:

E. Solid surface materials, Thermoplastic sheets, Acrylic or methacrylate sheets, Solid phenolic core, or any other special panel product, specify by brand name and design name/product number.

2.4. WOOD TREATMENT

A. List the specific local requirement for fire retardant treatment, if any.

B. List the specific chemical and process for preservative treatment, if any.

2.5. GLAZING, HARDWARE, AND ACCESSORIES

A. If glass is to be supplied by woodworker, the materials and requirements should be listed here.

- Wood stops shall conform to the QSI for the Grade of Work specified.
- Finish coats on glazed exterior work, if any, shall be allowed to flow on to the glass.

B. Fasteners: Size and type to suit application. Weather resistant if exterior. The QSI does not set standards for fasteners.

C. Hardware, if not specified by brand name and part number, shall be mill option to meet QSI minimums.

2.6. FABRICATION

A. Fabricate to [Premium] [Custom] [Economy] Quality Standards.

B. Shop prepare and identify components of assemblies for matching during site assembly.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. Select a joinery technique, or leave it up to the manufacturer to choose from QSI compliant methods.

2.7. FINISHING MATERIALS AND APPEARANCE

A. List the name of the finish system (topcoats) to be used from Section 1500

B. List the sheen desired: [Flat] [Satin] [Semi-gloss] [Gloss].

D. List the special or extra steps and/or products to be used, such as bleach, distressing, filler, glaze, shading, stain, toner or washcoats.

2.8. FINISHING REQUIREMENTS

A. Sand work smooth and set exposed nails [and screws].

- For opaque finishes, apply wood filler in exposed nail [and screw] indentations and sand smooth.
- For transparent finishes, use wax or burn-in filler which blends with surrounding color and sheen, often after stain and before final top coat.

B. When combining wood and laminates or other specialty products, careful consideration must be given to finishing specifications. Responsibility for finish wood parts should be clarified by the design professional here.

C. Finish work in the factory in accordance with Section 1500.

D. [Prime paint] [Seal] surfaces in contact with cementitious materials.

Part 3. EXECUTION

3.1. EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are in place and ready to receive this work.

3.2. INSTALLATION

A. Install work in accordance with [Premium] [Custom] [Economy] Grade, Section 1700, QSI.

B. Set and secure materials and components in place, plumb and level.

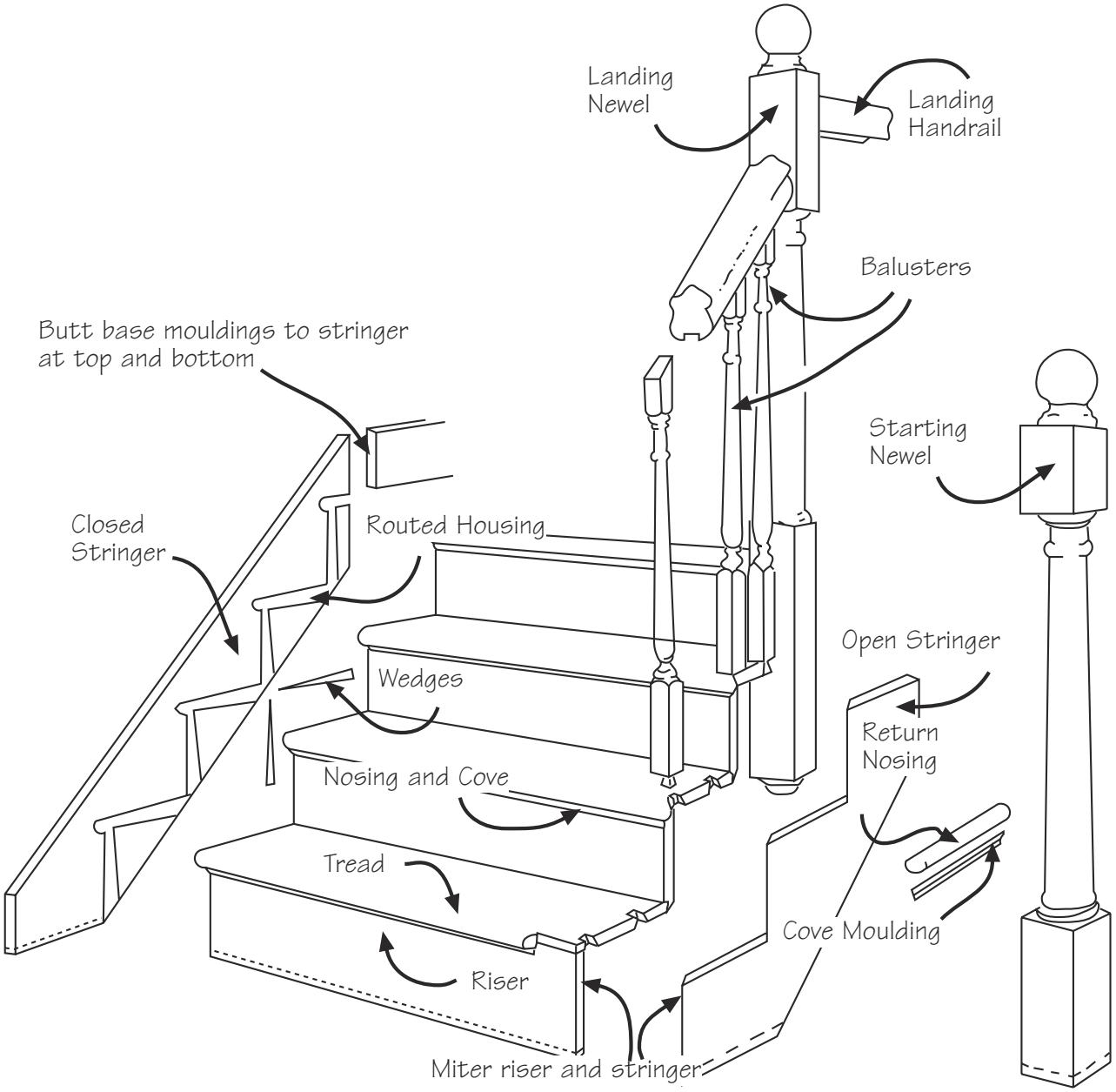
3.3. ADJUSTING

A. Adjust work under provisions of Section [ ] of the contract documents.

B. Adjust moving or operating parts to function smoothly and correctly.

3.4. CLEANING

A. Clean work under provisions of Section [ ] of the contract documents.



Stair Parts - Figure 800-01

General Criteria

800-G-1

Scope

Includes:

Interior stair stringers, treads, nosing, risers, starting steps, handrails, rail fittings, balusters, newel posts, and related trims.

Rails used on corridor walls and guard rails at glass openings.

Excludes:

Rough horses, structural wood framing or timbers, metal handrail brackets, metal safety nosing, flooring, and priming or painting.

Commodity stair parts purchased directly without the benefit of selection and production under AWI Quality Standards.

Exterior Stair or Rails.

800-G-2

Specification Requirements

GRADE MUST BE SPECIFIED

These standards provide for three grades: Premium, Custom, and Economy.

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.

800-G-3

Smoothness of flat, moulded and turned surfaces

The smoothness of surfaces which have been machined, planed, moulded, or turned is determined by the closeness of the knife cuts. The closer the cuts to each other (i.e., the more knife cuts per inch [KCPI]) the closer the ridges, and therefore the smoother the resulting appearance.

Surfaces can be further smoothed by sanding. Sandpapers come in grits from coarse to fine and are assigned ascending grit numbers. The coarser the grit, the faster the stock removal. The surface will show the striations caused by the grit. Sanding with finer grit papers will produce smoother surfaces.

800-G-4

Design Summary

This short summary is a collection of hints and illustrations about the challenges of designing and building safe stairs. The QSI cannot and does not offer these data as advice on code compliance. Safe stairs and design and engineering to meet local codes remains the responsibility of the design professional.

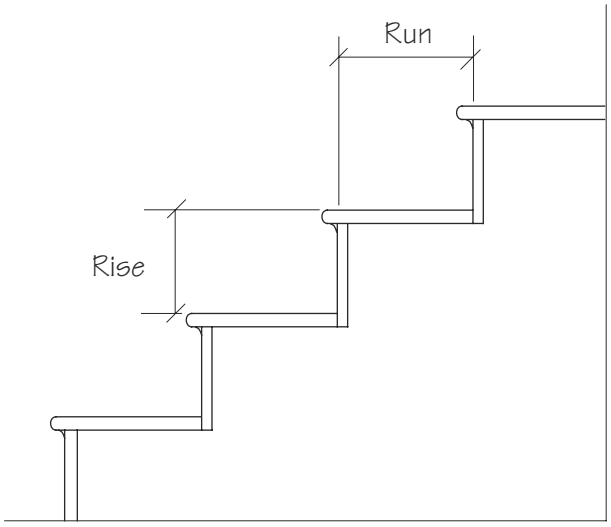
The three critical steps in stair design are…

- check local code;
- consult with an experienced stair builder to double check your geometry; and
- pre-clear your stair design with the local building officials.

NET STAIR WIDTH - The minimum width of a normal stairway is 1118 mm [44"] when expected occupant load is 50 or more. Otherwise the minimum width is usually 914 mm [36"].

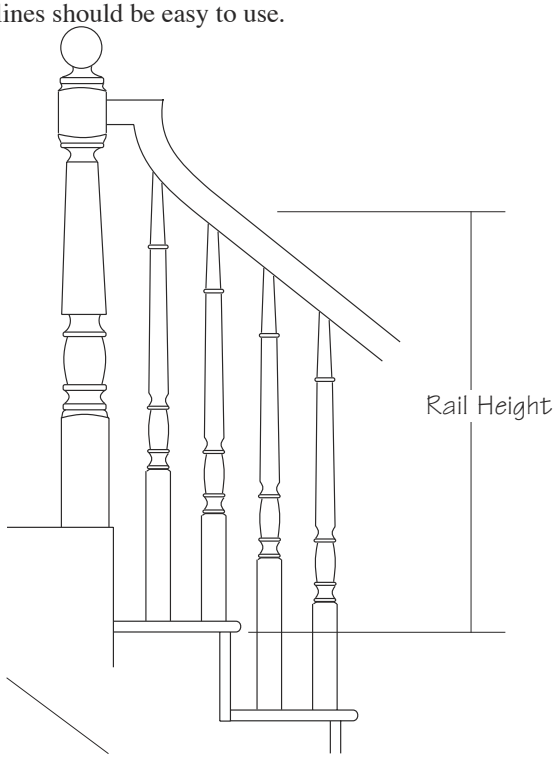
RISER HEIGHT - For stairways serving an occupant load of greater than 10 persons, the typical maximum riser height is about 178 mm [7"]. For stairways serving an occupant load of fewer than 10, the maximum riser height varies from 197 mm [7-3/4"] to 210 mm [8-1/4"] depending on local code. All codes agree that the height of each riser must be consistent with the others. Riser height is measured from the finished top of a tread to the finished top of the adjacent tread.

TREAD LENGTH (RUN) - For stairways serving an occupant load of greater than 10, the minimum tread length is usually 279 mm [11"]. For stairways serving fewer than 10, the minimum is usually 241 mm [9-1/2"]. Just as the rise must be consistent, so must the run.

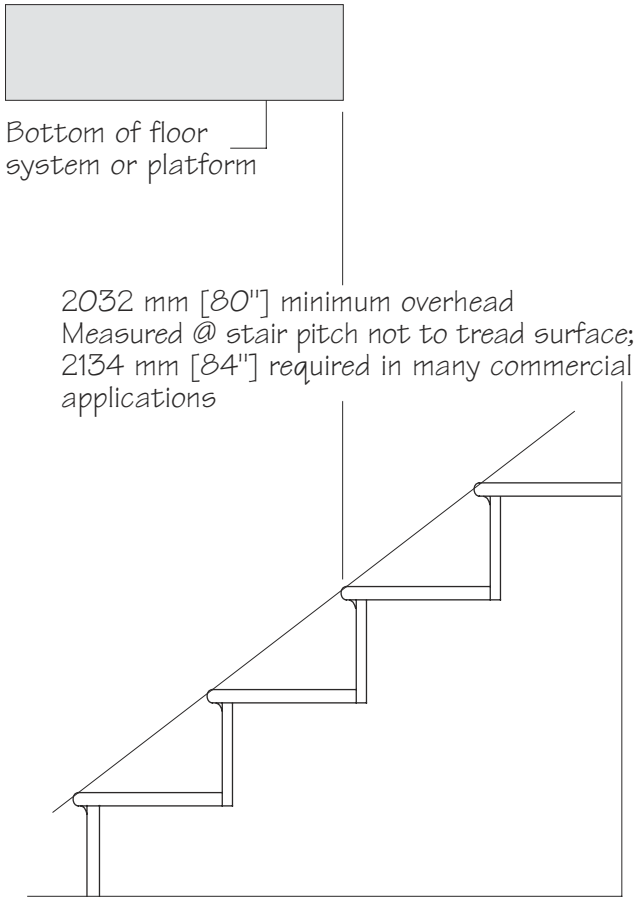


Rise and Run - Figure 800-02

RATIO OF RISER TO TREAD - There are some well established Imperial guidelines for stair layout. Three rules of thumb for a good relation between the height of a riser and the width of a tread are: (1) the tread width multiplied by the riser height in inches should equal between 72 and 75; (2) the tread width plus twice the riser height should equal about 25; or rise + run = about 17", remembering that the rise and run must work together. It is the pitch of the stair which makes it functional and safe. A stair which meets two of the three guidelines should be easy to use.



Handrail - Figure 800-04

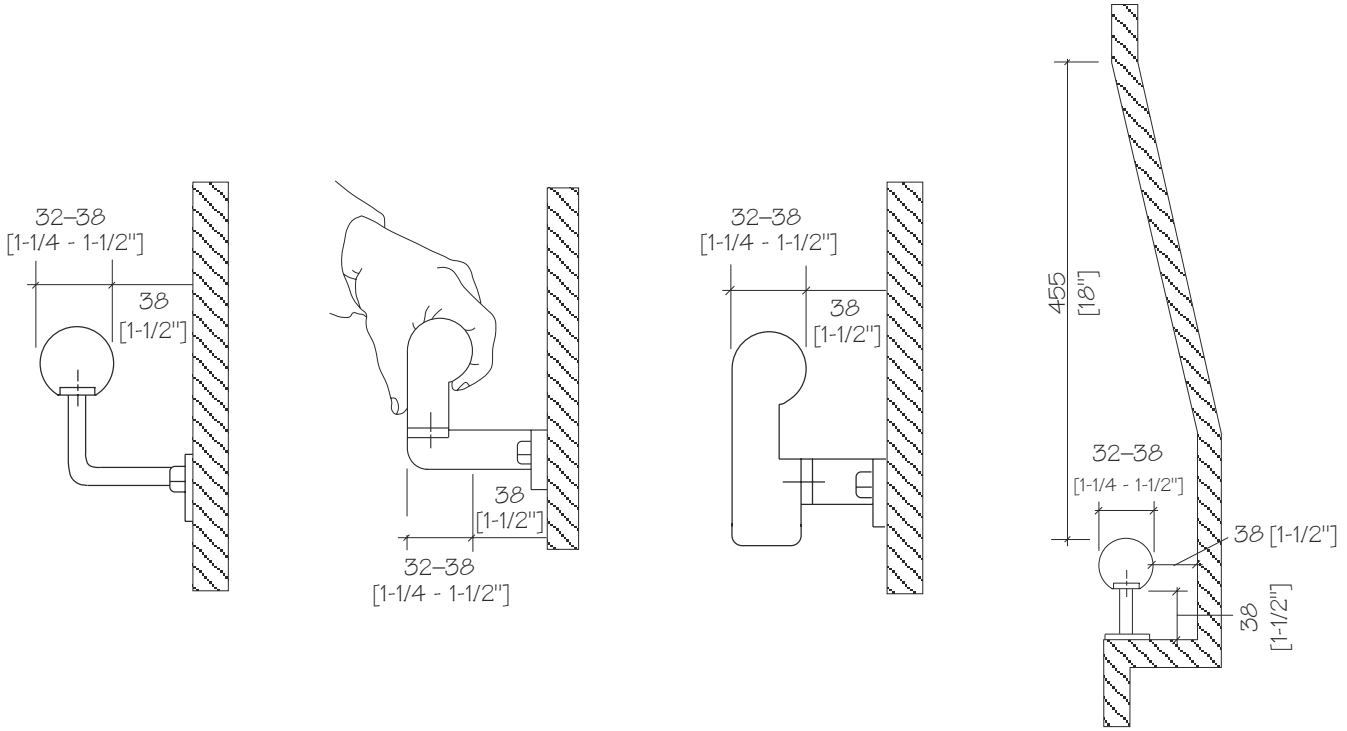


Headroom - Figure 800-03

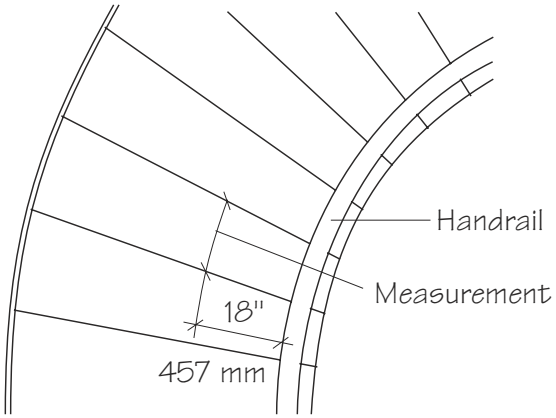
HEADROOM - A minimum of 2032 mm [80"] must be allowed for headroom measured from a plane parallel and tangent to the nose of the treads to all overhead points.

HANDRAILS - Stair handrails should be mounted in such a manner that the top of the handrail be no less than 864 mm [34"] and no more than 965 mm [38"] above tread and landing noses. Stairways wider than 1118 mm [44"] should include a handrail on both sides of the stair. Handrails should clear walls and other obstructions by no less than 38 mm [1-1/2"] to allow for adequate finger clearance, but should not project more than about 115 mm [4-1/2"] Consult all codes and requirements.

LEVEL BALUSTRADE - Balustrade at balconies or landings must be at least 914 mm [36"] above the finish floor for most residential applications and at least 1067 mm [42"] above the finish floor for most commercial applications. Some jurisdictions require the use of a guardrail in addition to the handrail on the stair.



Some Handrail Options - Figure 800-05



Winding Plan View - Figure 800-06

CURVED/CIRCULAR STAIRS - In most regional codes, a circular stair must have an inside radius that is no less than twice the width of the stair. Most books also specify a minimum tread run of 152 mm [6"] at the most restrictive point, but this is not always practical or possible Curved stairways with tighter radii and more limited tread run are usually allowed under stair codes. As a guide, the required tread run should be no less than 10", measured at a point 305-457 mm [12-18"] from the most restrictive (narrow) side of the stair.

Please consult with the local building department before committing a stair space to design details and project documents.

Technical Criteria

800-T-1

Specification Requirements

Architect or Design Professional shall …

• specify the Grade required;

• specify the species and type of cut;

• specify the grain direction and articulated joints. In the absence of such indication, the grain direction shall be at woodworker's option;

• specify the ornamental details and joinery that affect the æsthetics and function;

• specify the fire-retardant rating, if required; and

• specify the preservative treatment for exterior use, if required.

800-T-2
Materials

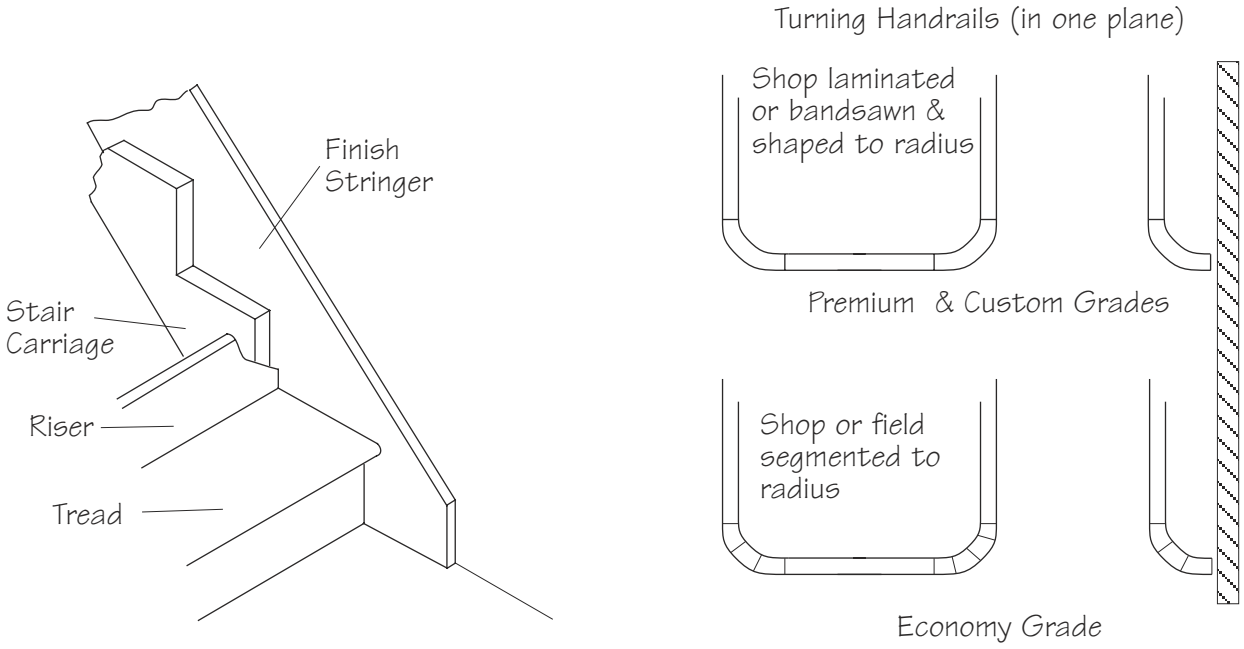
Hardwood members exceeding dimensions defined in Section 100 may be glued for width and thickness. Refer to Section 100 for maximum practical available lengths. If total length exceeds the practical available length of the species as defined in Section 100, members will be furnished in suitable lengths selected by the manufacturer.

Unless otherwise specified or detailed, the following standards shall apply:

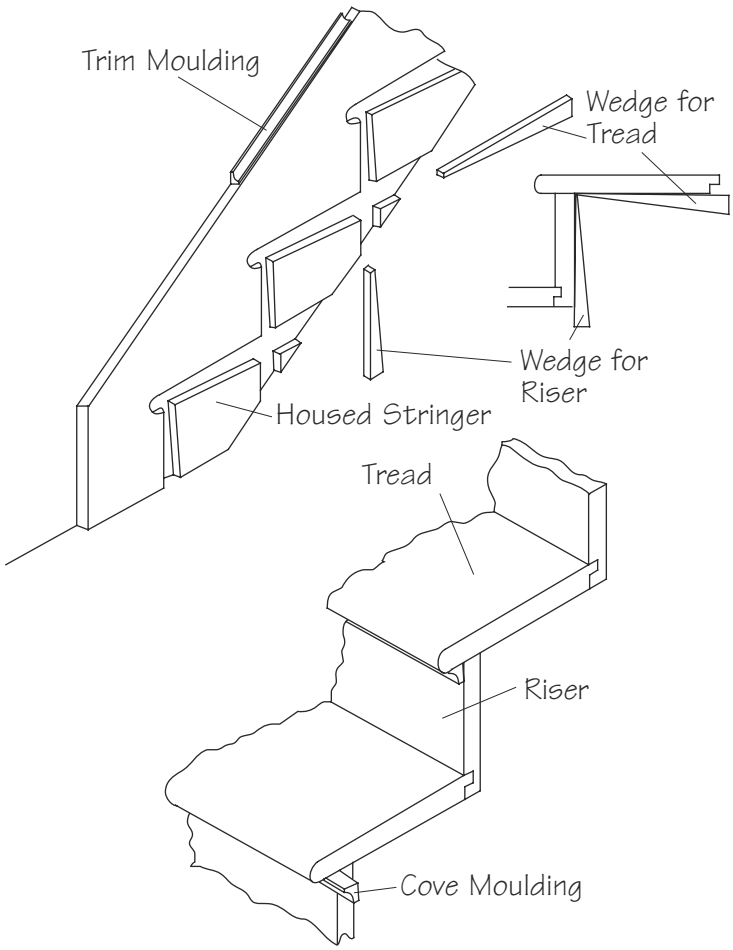
Materials	Premium		Custom		Economy	
	Transparent	Opaque	Transparent	Opaque	Transparent	Opaque
Lumber Grade	I	II	II	II	III	III
Cut of Lumber	Plain sawn	Plain sawn	Plain sawn	Plain sawn	Plain sawn	Plain sawn
NOTE: When panel products are used, consultation with the stair manufacturer prior to specification is recommended.						

800-T-3
Workmanship

	Premium	Custom	Economy
Circular stair stringers, rails and floor trim	Shop laminated to radius	Shop laminated to radius	Not applicable
Wall stringer	Routed to receive treads, risers, and wedges	Unrouted	Unrouted
Face stringer	Mitered or housed, wedged and glue-blocked underneath except open riser stairs or backpitch stairs	Mitered or housed, wedged and glue-blocked underneath except open riser stairs or backpitch stairs	Shop cut and/or miter not required
Treads, open end	Tongued into riser. Return nosing mitered to front edge - attached	Tongued into riser. Return nosing mitered to front edge - attached	No requirement
Treads, closed end	No machining	No machining	No machining
Treads, level	Tread supports shall be machined and installed within a maximum slope of 6 mm [1/4"] in 305 mm [12"]		
Risers	Routed to receive tongue on tread	No machining	No machining
Balusters, set to restrict passage of 100 mm [4"] ball	Dowel or pin on tread end; cut to fit on handrail end	Dowel or pin on tread end; uncut on handrail end	No requirement
Newel posts	Machined to fit assembly	No machining	No machining
Stair Handrails			
In-plant preparation of straight wood rails (field conditions permitting)	Assembled by rail bolts, joint fasteners, half-lap or dowel	Plant-prepared for jobsite joining by rail bolt, joint fasteners, half-lap or dowel	No machining
Radiused wood rails; rail returns; transitions; direction changes	Shop laminated to radius; assembled to straight rails as above	Shop laminated to radius; assembled to straight rails as above	Segmented radius joined by rail bolt, joint fasteners, half-lap or dowel
Note: Finger-jointed rail stock permitted for opaque finish, but only by direct specification for transparent finish.			



Stair Carriage - Figure 800-07



Workmanship Details - Figure 800-08

800-T-4

Smoothness of Exposed Surfaces

Smoothness Table	Premium		Custom		Economy	
	Transparent	Opaque	Transparent	Opaque	Transparent	Opaque
Sharp edges (Arris)	Eased with fine abrasive		Eased with fine abrasive		Mill option	
Top flat surfaces	150 grit		120 grit		100 grit or 15 KCPI	
Moulded surfaces	120 grit		minimum 20 KCPI			
Shaped surfaces	120 grit		minimum 20 KCPI			
Turned surfaces	120 grit		100 grit			
Sanding cross scratches	None allowed	Not to exceed 6.4 mm [.25"]	None allowed	Not to exceed 6.4 mm [.25"]		

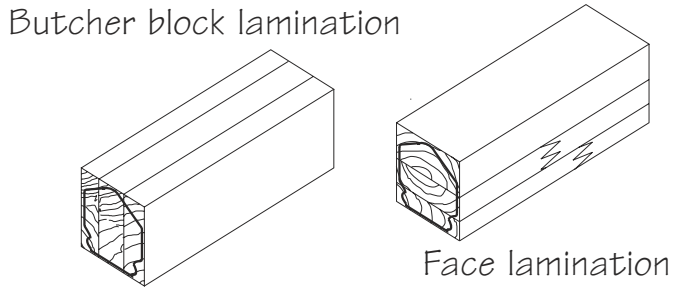
NOTE: No tearouts, knife nicks, or hit-or-miss finish allowed. No knife marks allowed where sanding is required. Surface variations as a result of multiple tool passes treated as turned surfaces above. Glue and filler, if used, must be inconspicuous and sanded as smoothly as the surrounding surface. Sanding before final stain and/or finish should be a consistent grit and scratch pattern, as it influences blend of color and sheen between components. Top Flat Surfaces are those which which can be sanded with a drum or wide belt sander. Turnings are customarily sanded on the lathe, and will exhibit cross scratches.

Before finishing, all exposed portions of architectural woodwork shall have handling marks or effects of exposure to humidity or moisture removed by a thorough uniform final sanding. The sanded surface shall then be cleaned and dust free, prior to proceeding with the first step in the finishing process. Veneer sand-through, with veneer sanded to the point where cross banding or core is visible, and/or core telegraphing (variation from a true plane in excess of 0.25 mm [0.010"] in any 76 mm [3"] span) is not allowed in any Grade.

800-T-5

Methods of Rail Fabrication

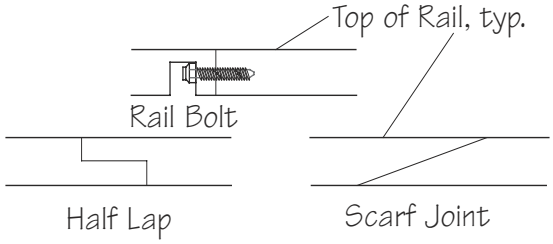
Unless specified otherwise, large dimension rail fabrication techniques are at the option of the woodworker. Lamination on a radius depends on many factors. Some curved parts are cut from blocks. Consult with the manufacturer. Some methods include:



Rail lamination - Figure 800-09

800-T-6

Methods of Plant Assembly of Rails



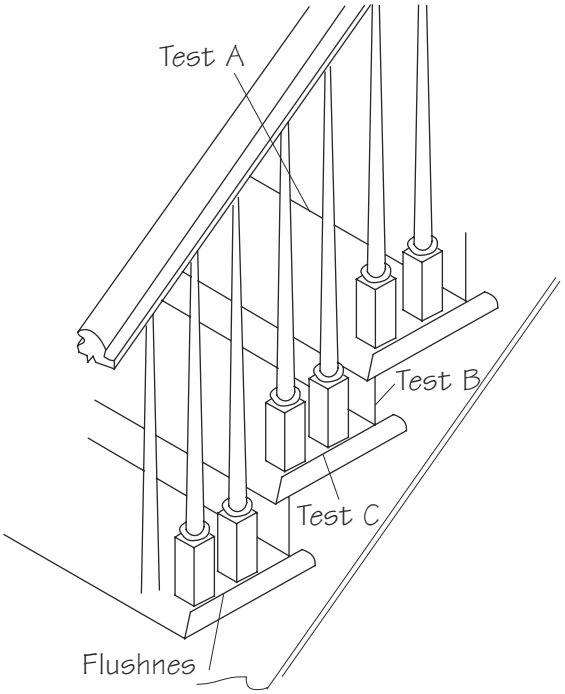
Plant Assembly of Rails - Figure 800-10

800-T-7

Tightness and Flushness of Plant Assembled Joints

NOTE: It is unlikely that plant assembly of Economy Grade stair work is offered by the manufacturer. Design professionals are encouraged to involve the woodwork manufacturer early in the design phase of the project.

Plant Assembled Joint Table	Premium		Custom		Economy	
	Interior	Exterior	Interior	Exterior	Interior	Exterior
Maximum gap: Test A	0.4 mm [.015"] wide by 20% of joint length	0.6 mm [.025"] wide by 30% of joint length	0.6 mm [.025"] wide by 20% of joint length	1.3 mm [.050"] wide by 30% of joint length	1.3 mm [.050"] wide by 20% of joint length	1.9 mm [.075"] wide by 30% of joint length
Maximum gap: Test B	0.4 mm [.015"] x 76 mm [3"], and no gap may occur within 1829 mm [72"] of a similar gap	0.6 mm [.025"] x 152 mm [6"], and no gap may occur within 762 mm [30"] of a similar gap	0.6 mm [.025"] x 152 mm [6"], and no gap may occur within 1524 mm [60"] of a similar gap	1.3 mm [.050"] x 203 mm [8"], and no gap may occur within 660 mm [26"] of a similar gap	1.3 mm [.050"] x 203 mm [8"], and no gap may occur within 1219 mm [48"] of a similar gap	1.9 mm [.075"] x 254 mm [10"], and no gap may occur within 610 mm [24"] of a similar gap
Maximum gap: Test C	0.4 mm [.015"]	0.6 mm [.025"]	0.6 mm [.025"]	1.3 mm [.050"]	1.3 mm [.050"]	1.9 mm [.075"]
Maximum gap between fixed components shall be tested at points designed to join; where members connect or touch.						
Flushness Variation	0.03 mm [.001"]	0.4 mm [.015"]	0.1 mm [.005"]	0.6 mm [.025"]	0.6 mm [.025"]	1.3 mm [.050"]



Test Locations - Figure 800-11

800-T-8

Selection for Grain and Color

For transparent finish, adjacent members shall …

• Premium Grade: … be well matched for grain and color.

• Custom Grade: … be compatible for color.

• Economy Grade: … not be selected.

Visible finger joints not permitted in Premium and Custom Grades. No selection for grain or color is required for Opaque finish in any Grade.

Field Assemblies

Selection of adjacent members for compatibility is the responsibility of the installation contractor.

Compliance Criteria

800-C-1

Tests for Smoothness of Exposed Surfaces

KCPI (Knife Cuts Per Inch) can be determined by holding the surfaced board at an angle to a strong light source and counting the visible ridges per inch, usually perpendicular to the profile.

SANDING can best be checked by sanding a sample piece of the same species with the required grit of abrasive. Observation with a hand lens of the prepared sample and the material in question will offer a comparison of the scratch marks of the abrasive grit. Reasonable assessment of the performance of the finished product will be weighed against absolute compliance with the standard.

800-C-2

Tightness and Flushness of Plant Assembled Joints

Joint tightness and/or flushness will meet the standard when tested with a feeler gauge at the points indicated in the illustration. Joint length will be measured with a ruler with a minimum division of 1 mm [$^{1}/_{16}$"] and calculations made accordingly. Reasonable assessment of the performance of the finished product will be weighed against absolute compliance with the Standards.

Design Ideas

800-D

Freedom of Expression

Custom-designed woodwork gives you complete freedom of expression.

• Design flexibility: The use of custom-designed woodwork in a building allows the design professional freedom of expression while meeting the functional needs of the client. A custom-designed building is enhanced by the use of custom-designed woodwork.

• Cost effective: Custom woodwork does compete favorably with mass-produced millwork, and offers practically limitless variations of design and material. Most woodwork lasts the life of the building ą quality counts.

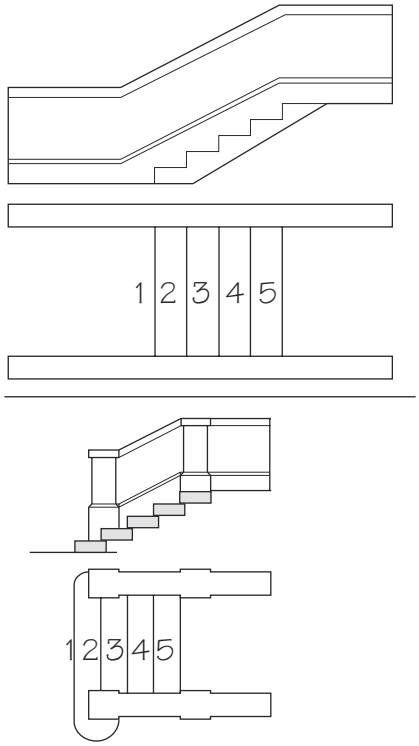
• Complete adaptability: By using custom woodwork, the architect or designer can readily conceal plumbing, electrical and other mechanical equipment without compromising the design criteria.

• No restrictions: Custom architectural woodwork permits complete freedom of selection of any of the numerous hardwoods and softwoods available for transparent or opaque finish. Other unique materials available from woodwork manufacturers require no further finishing at all, such as plastic laminates and decorative overlays. These materials can be fashioned into a wide variety of profiles, sizes, and configurations. The owner and design professional have the best of both worlds - high quality and freedom of choice.

• Dimensional flexibility: Since custom woodwork is normally produced by a specialty architectural woodwork firm, dimensions can easily be changed prior to actual fabrication, if required by job conditions. Special situations such as designing for the handicapped can readily be accommodated by the custom architectural woodwork manufacturer.

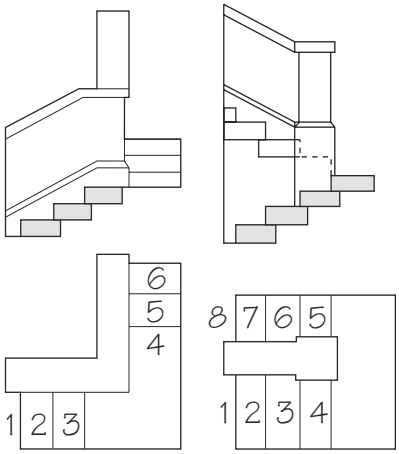
• Quality assurance: Adherence to the QSI and specifications will provide the design professional a quality product at a competitive price. Use of a qualified AWI/AWMAC member firm will help ensure the woodworker's understanding of the quality level required.

800-D-1
Straight Runs



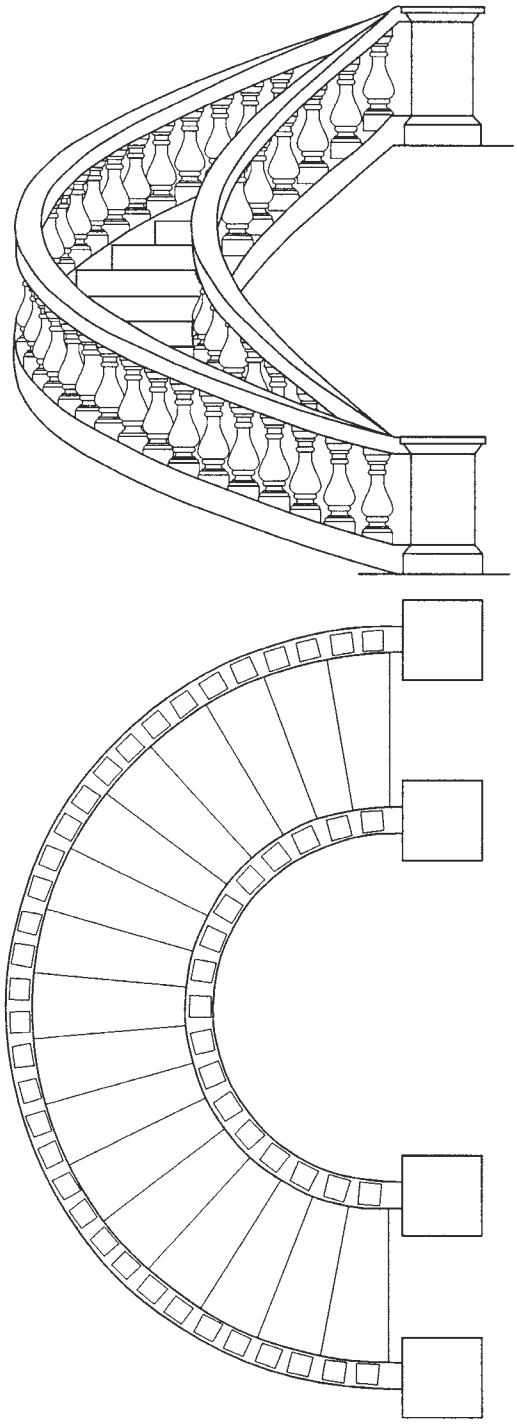
Straight - Figure 800-12

800-D-2
Turning Runs



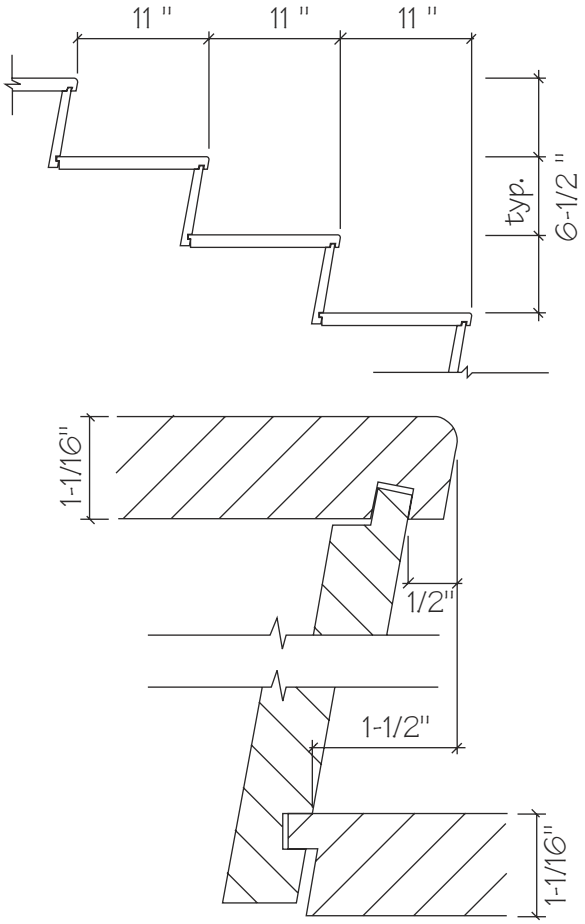
Turning - Figure 800-13

800-D-3
Winding Run



Classic Winding - Figure 800-14

800-D-4
Backpitch Example



Backpitch Stair - Figure 800-15