

GLUED LAMINATED TIMBER APPEARANCE CLASSIFICATIONS FOR CONSTRUCTION APPLICATIONS

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This Technical Note clarifies the distinction between appearance considerations and structural properties of glued laminated timber (glulam) members. In addition, it describes practical buyer-seller appearance classifications of glulam members as they are commonly used in residential and commercial construction applications.

Introduction

Industry recommendations for the finished appearance of glued laminated timber have traditionally identified three “grades:” Premium, Architectural and Industrial. All of these appearance “grades” permit the individual laminations used in the glulam layup to possess the natural growth characteristics of the laminating lumber grades specified. In order to account for the visual impact of these natural growth characteristics, cosmetic repairs may be made to the finished member as required to meet the desired finished appearance.

However, the use of the term appearance “grades” associated with these non-structural cosmetic classifications often leads to confusion in the marketplace. Specifiers and users often think of appearance “grades” in terms of structural distinctions when in fact structural

properties for a given glulam layup are independent of appearance considerations. As an example, a Premium appearance classification may be specified based on the presumption that the member will have better structural characteristics than an Architectural or Industrial classification when, in fact, all three classifications will have identical strength characteristics if manufactured to the same layup combination. To minimize this confusion, Engineered Wood Systems (EWS) identifies these different appearance characteristics as appearance “classifications” rather than “grades.”

Appearance Characteristics vs. Structural Properties of Glulam

Structural properties of glulam are established by industry manufacturing specifications and/or building code research approvals. Lumber species and grades are specified for glulam in various layup combinations that in turn establish specific design properties for the given member.

A typical layup combination (or structural grade) would have a designation such as 24F-V4 (DF) or 24F-V5 (SP) depending on species and end use requirements. These layup combinations require that a certain species of lumber be used and that specific grades of lumber be positioned throughout the depth of the member in accordance with their individual strength characteristics.

Lumber grade characteristics, such as open knots or other voids, and the appearance considerations inherent in the glulam manufacturing process itself may be cosmetically altered based on the desired finished member appearance for any layup combination. However, the structural properties assigned for the specified layup combination (or structural grade) are not affected by these cosmetic modifications that are made to change the finished member’s appearance. (See EWS Technical Note Y117 for a more detailed discussion of allowable design properties for glulam.)

Commentary on Appearance Classes

It is important to understand that the individual laminations used in the manufacture of any glulam product may possess the natural growth characteristics permitted for the lumber grade specified, regardless of finished member appearance classification. This is the basic premise for defining the appearance classifications that follow.

Premium Appearance – The highest appearance classification for use when appearance is the primary design consideration. Specific characteristics of this classification are:

In exposed surfaces, all knot holes and other voids shall be filled with a wood-tone filler or with clear inserts selected for similarity with the grain and color of the adjacent wood.

The wide face of laminations exposed to view shall be selected for appearance and shall be free of loose knots with the knot sizes limited to 20% of the net face width of the lamination.

Not over two maximum size knots or their equivalent shall occur in a 6-foot length.

All voids shall be filled in exposed surfaces.

Voids greater than 1/16 inch wide created by edge joints appearing on the wide face of the lamination exposed to view shall be filled.

Exposed surfaces shall be surfaced smooth with no misses permitted.

The corners of the wide faces exposed to view shall be eased.

Commentary – This is perhaps the most misunderstood classification. Because of its name, specifiers and end users often equate this to what the glulam industry refers to as a “furniture grade,” i.e. the customer expects the finished glulam to approach the appearance of high quality furniture. Unfortunately, this is not possible and although all voids will be filled, the finished glulam will still exhibit the natural visual characteristics of lumber such as knots. Also, this appearance class is often specified based on the misunderstanding that it will impart higher strength properties to the member; when in fact, it does not.

Premium appearance should only be specified when the highest available visual characteristics of glulam are required and where exposed glulam members must have smooth surfaces suitable for staining and painting. The use of glulam as the structural framing members in religious structures is just one example where this appearance classification is typically specified. The specifier is cautioned that Premium appearance glulam is not a stock item and longer lead times are required to obtain this type of product.

Architectural Appearance – A high quality appearance suitable for applications where appearance is an important

but not overriding consideration. Specific characteristics of this classification are:

In exposed surfaces, all knot holes and voids measuring over 3/4" shall be filled with a wood-tone filler or clear wood inserts selected for similarity with the grain and color of the adjacent wood.

The wide face of laminations exposed to view shall be free of loose knots and open knot holes shall be filled.

Knot holes shall not exceed 3/4 inch when measured in the direction of the lamination length with the exception that a void may be longer than 3/4 inch if its area is not greater than 1/2 in.²

Voids greater than 1/16 inch wide created by edge joints appearing on the wide face of the lamination exposed to view shall be filled.

Exposed surfaces shall be surfaced smooth with no misses permitted.

The corners of the wide faces exposed to view shall be eased.

Commentary – This is perhaps the most versatile and widely specified appearance classification because it is compatible with a wide range of building designs. Most of the voids associated with the natural characteristics of the laminating lumber are filled for an Architectural appearance classification. This classification is suitable for a variety of construction applications where glulam members are exposed in the finished structure such as in residences, office buildings, restaurants, schools and a myriad of other similar uses where finished appearance is of importance but is not the overriding consideration.

Most “stock beams” inventoried by distributors and dealers for residential and light commercial uses are Architectural appearance. This permits the contractor to use them in an exposed application if required, while also effectively using them in concealed applications such as headers and floor beams.

Industrial Appearance – The minimal appearance classification normally suitable for use in industrial plants, warehouses and other similar structures and for concealed applications where appearance is not of primary concern. Specific characteristics of this grade are:

Voids appearing on the edges of laminations need not be filled.

Loose knots and knot holes appearing on the wide face of the laminations exposed to view shall be filled.

Members are required to be surfaced on two sides only and the appearance requirements apply only to these sides.

Occasional misses, low laminations or wane (limited to a maximum of 1/4 inch measured across the width) are permitted on a cumulative basis, not to exceed 10% of the width of the member at any glueline. The frequency of occurrence shall not exceed one in ten pieces of lumber used. The maximum area of low laminations shall not exceed 5% of the surface area of a side and no more than two low laminations shall be adjacent to one another. Permissible wane in accordance with the provisions of the layup combination is not limited in length.

Commentary – Industrial appearance is just what its name says, an appearance classification that is suitable for most industrial applications such as roof beams in warehouses or manufacturing facilities where the appearance of the exposed glulam is not of primary importance. These are also typically used when the members will be concealed by suspended ceilings or other coverings, regardless of the type of construction.

Framing Appearance – The Framing appearance classification is a new classification introduced by the industry to accommodate home building and other construction markets where glulam is used in combination with dimension lumber in roof, wall and floor framing. To

be compatible with the conventional framing lumber sizes without the need for furring or other specialized framing, glulam is supplied in 3-1/2, 5-1/2 and 7-1/4-inch widths.

Glulam members manufactured to be compatible with these dimensions are finished to what are referred to in the industry as “hit or miss” surfacing. Since none of the previously described appearance classifications have this minimal level of surfacing, the new Framing classification was introduced.

Surface characteristics of glulam members finished to this classification include:

Manufacturing characteristics including low laminations, glue smear, end joint offsets and glue line squeezeout are permitted.

Lumber characteristics permitted for the given layup combination may include knot holes, splits and wane.

Voids appearing on the edge of laminations need not be filled.

Loose knots and knot holes appearing on the wide face of the laminations exposed to view need not be filled.

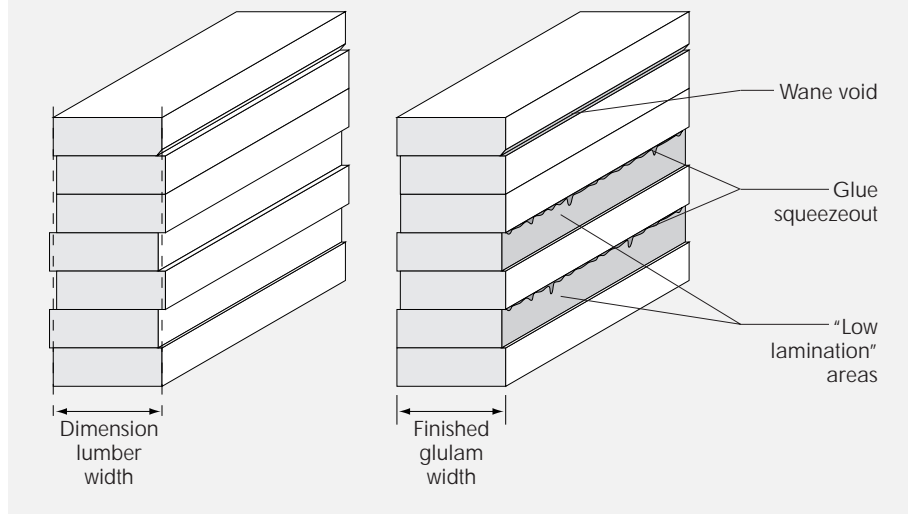
Members are required to be surfaced “hit or miss” on two sides only and the appearance requirements apply only to these sides.

Wane (limited to a maximum of 1/4 inch measured across the width) is permitted on a cumulative basis. The accumulative depth of hit and miss and wane shall not exceed 10% of the width of the member in any glue line. The frequency of occurrence shall not exceed one in ten pieces of lumber used. The maximum area of low laminations shall not exceed 25% of the surface area of a side. Permissible wane in accordance with the provisions of the layup combination is not limited in length.

Commentary – The surface irregularities common to the glulam manufacturing process are typically removed by surfacing to standard glulam widths of 3 inches

FIGURE 1

MANUFACTURING IRREGULARITIES PERMITTED IN FRAMING APPEARANCE CLASSIFICATION



or 3-1/8 inches for nominal 4-inch members, and to 5 inches or 5-1/8 inches for nominal 6-inch members, depending on the species used. As noted, the Framing appearance member widths are surfaced to net sizes (3-1/2 inches and 5-1/2 inches) which permit width compatibility with dimension lumber sizes used in conventional 2x4 and 2x6 framing systems. Figure 1 above illustrates some of the manufacturing and lumber characteristics that would be permitted in the Framing appearance classification when glulam is surfaced to match dimension lumber widths.

As indicated, glulam surfaced to net dimension lumber widths will typically result in areas of low laminations and voids due to the presence of wane lumber that may not be surfaced away as shown in the illustration. Glue squeezeout along glue lines in low lamination and wane areas may also be visible in the finished width of the Framing classification. This appearance class should be used only when the member will be concealed from view in suspended ceilings, headers, or other applications where appearance is not important.

It is also applicable to resawn glulam beams that have a sawn surface on one vertical face.

Special Appearance Considerations

In addition to the appearance classifications described in this Technical Note, additional appearance requirements for glulam members may be specified based on buyer-seller agreement in accordance with project specifications. Such special appearances may include rough sawn surface texturing, plant application of stains or other surface finishing. The specifier or buyer are urged to contact their supplier before specifying any special appearances.

Further Information

For further information on any aspect of designing with glued laminated timber, contact:

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