

## Redwood Lumber Grades

### Appearance Grade vs. Structural Grade Redwood

While both appearance and structural grades of redwood lumber are defined by appearance or visual characteristics, they have very different applications. For cooling towers and other structural applications, grading rules for structural grades of redwood establish requirements for strength characteristics such as slope of grain, knot size and frequency, and rate of growth. Appearance grades of redwood are based more on knot size and frequency. Historically, high quality appearance grades of redwood have been specified for cooling tower applications on the assumption that good appearance would be coincident with high strength. Although there is a correlation between good appearance and small, infrequent

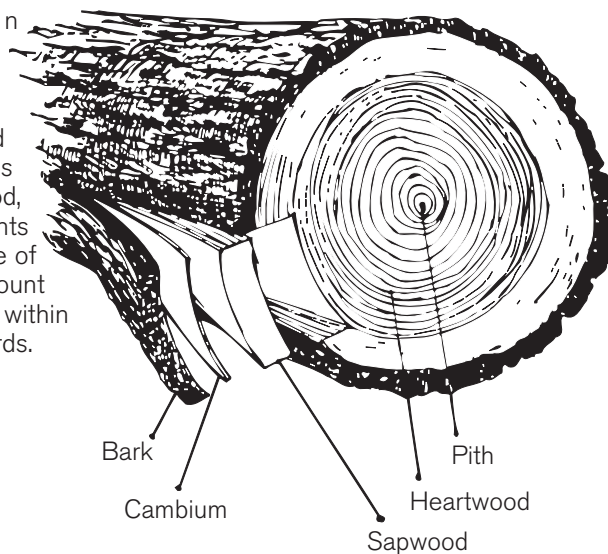
knots, there is not a direct relationship between good appearance and the more important strength characteristics of slope of grain or rate of growth.

Requirements for both appearance and structural grades of redwood are established by the Redwood Inspection Service (RIS), a division of California Redwood Association and published in the Standard Specifications for Grades of California Redwood Lumber. For the structural grades, allowable stress levels based on RIS working stress, are established and published in the National Design Specification for Wood Construction (NDS) and the Cooling Technology Institute (CTI) Bulletin STD-103.

Appearance grades of redwood include "Clear" and "Select". Structural grades of redwood include "Clear Structural", "Select Structural", "No. 1 Structural", etc. Note the similarity of grade callouts (e.g., "Clear" vs. "Clear Structural"). Inclusion of the term "Structural" in the grade indicates structural grading. Inclusion of the word "Heart" in the grade (e.g., "No. 1 Heart Structural") indicates that in addition to meeting grade requirements, the member must also be cut strictly from the heartwood portion of the log, as discussed below.

### Heartwood vs. Sapwood Redwood

The best value in redwood for cooling tower applications, both for serviceability and cost, is structurally graded treated redwood which is not restricted to heartwood, meets strength requirements for slope of grain and rate of growth (i.e., growth ring count per inch) and allows knots within structural grading standards.



Further complicating redwood specifications is the question of heartwood versus sapwood. Either appearance or structural grades may specify "to be cut from only the heartwood portion of the log". Heartwood typically is pink or red and is naturally more resistant to decay and insect attack than untreated sapwood. However, properly treated sapwood is equally as resistant as treated heartwood. This is because heartwood is more difficult to penetrate with treatment solution than sapwood, and therefore, heartwood's natural resistance to decay is offset by its limited treatability.



## Heartwood vs. Sapwood Redwood

Heartwood is cut from the center portion of the log, excluding the heart center (pith) for cooling tower applications. (See The *Marley Difference* Item MC-4). The portion of a log which is heartwood varies between “old” or first growth versus second growth redwood, with “old” growth yielding a greater percentage. If the heartwood must also meet knot-

free appearance grade requirements (e.g., “Clear Heart”), the availability of raw material is further restricted. As the world’s source for “old” growth redwood diminishes, knot-free heartwood which also meets structural requirements for cooling towers, is becoming increasingly difficult to obtain.

## The Marley Difference

Marley provides structural grades of redwood for applications in cooling tower structures fabricated from a minimum grade of “No. 1 Structural”. For many cooling tower structural members, this grade provides more than adequate strength for the application. Highly stressed members are fabricated from “Select Structural” or “Clear Structural” grades as required by loading.

When customer specifications call for appearance grade lumber, Marley assures that structural members meet not only appearance grade requirements, but also structural grade requirements. Other cooling tower manufacturers may provide only the specified appearance grade without attention to strength requirements. The lumber may have good appearance and meet the specification, however structural integrity may be at risk.

Marley also assures that quality appearance grade lumber is provided in applications where strength is not a concern, but where tight knots, limited in size and frequency, are important. Fan deck flooring, where Marley uses “Select” appearance grade lumber, is an example of such an application.

The Marley difference exists in a balance of appearance grades and structural grades that are matched to each specific structural member’s needs. This balance of design and application results in quality redwood structures that meet both CTI and timber industry standards, and are unparalleled in the cooling tower industry.

## How to Specify

In your specification, we suggest the use of language similar to the following:

*Lumber shall be treated\* structural grade California Redwood per the Redwood Inspection Services Standard Specifications for Grades of California Redwood. Structural members shall be designed in accordance with CTI Bulletin STD-103. Appearance grade lumber shall not be used for cooling tower structural members.*

\*see The *Marley Difference* “Item- MC-3” for specification of treatment.

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## Remember

The best value in redwood for cooling tower applications, both for serviceability and cost, is structurally graded, treated redwood which:

- is not restricted to heartwood.
- meets strength requirements for slope of grain and rate of growth (i.e., growth ring count per inch).
- allows knots within structural grading standards.

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