

The Notes in Screen Number Order as they appear on the PowerPoint file for:
Architectural and Design Uses of Reclaimed Wood

INTRODUCTION – 10 MINUTES

1 -Welcome to Reclaimed Woods by Goodwin. I'm Carol. My husband George is the original River Recovered specialist. For 36 years we've recovered logs from river bottoms. These were some of the first logs to be cut over 125 years ago from America's virgin forest, so the wood is denser and has a richer patina. We offer a complete line of flooring, stair parts and millworks... solid or engineered... unfinished or pre-finished.

2 - George's vision for Goodwin has always been to partner with the design build team from proper kiln drying, to precision milling to grading by established standards. George's attention to detail simplifies the installation to save you money.

George locates salvaged wood to offer any grade you want. He rescues Wild Black Cherry, Mahogany after hurricanes in Costa Rica and finds sustainably harvested exotics from community managed forests in Central America that are often forest certified.

We hope to partner with you when you need reclaimed wood.

3 - Today we'll learn:

- A little about wood in general
- The Rich History of these antique woods
- Grading and comparisons so you know how to get the wood you want
- Why you need to specify the basics of wood science
- Which finish to use on reclaimed wood
- A few case studies to avoid unnecessary problems.

This course is two learning credits, HSW, AIA and IDCEC. After this hour we'll email you slides, handouts and a number of reference materials that make up the second hour. Reference materials include: a sample master spec, install guidelines, wood floor problems/causes & cures, measuring moisture in concrete and articles we have found useful for specifications.

I'll send you a short quiz followed by your certificate and event numbers for registration with IDCEC. We'll submit the AIA credits. And I'll connect you with the real experts back at Goodwin.

Before we begin the learning objectives, I want to show you some beautiful wood floors that illustrate a few of the key points I'll be making throughout the presentation.

4 -George Goodwin had an 1887 hand drawn map of Florida's forests that we traced into CAD and cut out of reclaimed wood.

Condominiums and vacation homes are often not occupied a good bit of the year. If the HVAC is turned off humidity can build up and get between the boards to the underside and cause the floor to cup. Of course you have to understand a problem in order to solve; however it's very low cost

to back seal the boards with inexpensive polyurethane before installation. Polyurethane does not encapsulate wood but it does slow down the wood's ability to take on give off moisture and balances both sides of the wood to avoid cupping.

With wide boards or large rooms start the installation in the middle and nail toward both walls with spline glued into the grooves of the middle boards. Because the tongue side is held down with fasteners, most of the movement is on the groove side, so you cut the shrink/swell in half.

5 - This hunt lodge owner wanted a 14' medallion in his trophy room. We used engineered wood to match the height of the tile. Plus engineered floor shrinks and swells 5 times less than solid wood, making it more stable.

You can see the fish cut out of wood and 12" end-grain tiles around the perimeter. Here's the installer with some of the trophies at the top left.

Even with engineered wood we always recommend sealing the concrete. It may be dry now; however, you don't know what will occur after storms or leaks. A well made engineered wood with a water resistant plywood backer and high-quality glues can dry out and usually be fine if you get the water off relatively quickly, but it can't dry out if the concrete isn't sealed.

6 – An installer called to ask if we had any logs 4' wide. He left Goodwin about 10:00 at night on a Tuesday after using our big sander for hours on the large heart cypress log rounds. He needed to have this photo in St. Louis the following Monday to win the Floor of the Year contest. He used denatured alcohol to remove the water from the wood cells of the cypress round and solvents and heat treatment before the finish.

Every installer should own a moisture meter. Use the kind with pins that measure electrical resistance and orient the pins with the grain, as that is how the meters are calibrated. Meters that sit on top of wood measure specific gravity and do not work well on dense reclaimed wood. This step is the most important specification to make sure that the wood and site are installed at the expected long-term MC. One of your handouts will be 'Wood and Moisture' by our COO.

The installer used the proper vapor retarders underneath the floorboards and the elastomeric glues with a vapor retarder in them underneath the log rounds and curly heart pine herringbone.

7 - The last quick tip for now is using enough fasteners for a nail down floor. This was an 8" Cherry floor so we nailed every 3". Our Guidelines include the nail schedule for solid wood as: 6" if 3" face, 4" if 6" face, 3" if 8" face and 2" if 10" face, no more than 1-1/2" from end to avoid splits. For engineered wood floor it is: 6" for 4", 5" for 6" and 4" for 8" face.

The reason for more nails in a wider product is basically to get close to the same number per sq ft. It is not just expansion and contraction of the flooring that you take into account but you are trying to get the flooring to conform to the sub floor.

The other consideration is that the engineered is thinner than the standard solid and is less stiff in some directions. It comes down to the quality of installation you want to do. The good installers I know use more nails than average.

We needed a simple medallion to enter a contest, so our COO, made this in a couple of days.

It was less expensive on this unlevel concrete slab to install over plywood than to use the leveling compounds. You want to specify that the floor is no more than 1/4" out over 10' and 1/8" over 6'. You can use felt to raise low spots and grind the plywood to eliminate high spots.

BEGIN WOOD IN GENERAL – 10 MINUTES

8 - Wood floors are the best choice for the environment for several reasons.

- Manufacturing is cleaner. Steel products give off harmful chemicals and concrete leaches a good bit of carbon dioxide.
- Wood requires less energy. Brick takes four times more energy, concrete six and steel 40 times more energy to manufacture than wood.
- It takes 15" of concrete to equal the insulation qualities of just one inch of wood.

9 -About 10% of the world's forests are certified sustainable. Certification started in Europe with the PEFC. Only 8% of the 10% are in the rain forests where we have more concern than in Boreal regions of Europe and North America.

The National Academy of Sciences collected satellite data over many years to prove that tropical deforestation is concentrated in relatively small areas in Brazil and Malaysia This fact based data makes it possible to fund intensive agriculture solutions in poor countries.

10 - Hardwoods versus softwoods don't tell us much about the density or durability of wood. Heart pine is a soft wood that is as hard as red oak.

A 100 years ago southern yellow pine meant longleaf pine. Today it is mostly slash pine or loblolly. You can make more money with longleaf. The rotation is 40-50 years or twice as long..

The community run exotic forest operations that we have visited .are often certified

Heartwood forms when the sapwood becomes inactive and is infused with additional extractives depending on the specie. The heartwood is much more durable in general.

Here is the end of a 2,000 year old heart cypress tree loaded onto a railroad car.

11 – We need to use some of the sustainably harvested community forest exotics. We've seen these .mills cutting long Mahogany boards into 2' pieces to go for parquet floors in Europe.

Engineered floors are a fast growing trend. They require 2-1/2 times the labor to make, so most are made in China and sent back through distributors then showrooms than manufactured here.

The new finishes are low or no VOCs and much easier to maintain. If you get scratches you can apply more oil and maintain them yourself.

You can have a handscraped, saw kerf marked or wire brushed floor if you want distressing. These treatments were the way wood was long ago before modern saws and finishing equipment. Today they can entail a good bit extra labor.

12 - Wood floors require fewer chemicals to clean and are a good choice for anyone with allergies.

Installation trends are more toward engineered wood products every year. When a friend voiced concern about her pet's cough in a home she had bought, she tested her engineered wood floor for formaldehyde. It read .23 to .51 ppm versus the .1 that CARB specifies as the highest safe level. Look for products with certified formaldehyde emissions from glues and backers.

13 - Forests today do not have the dense growing conditions and the lengthy growth required to make the dense hard durable wood from America's first forests.

George and Norm Abrams from This Old House told me they thought the straps were coming loose as they had to stop and tighten them. Then they realized they were bending the axels on the trailer.

14 - Reclaimed wood requires more labor and craftsmanship. There can be 100 nails or more in an old beam, all of which have to be carefully located and removed.

The river recovered pine logs are all at least 200 years or 500 years plus for the heart cypress. Most have internal fractures where the tree has survived a windstorm or lightning. George carefully turns and saw the logs to render the highest quality and best yield.

The lumber must be air-dried down to the mid-teens in MC and carefully kiln dried generally to 6-8% for proper acclimation to the expected average humidity and temperature of the building.

Reclaimed wood is graded at sawing, after kiln-drying, after milling and finally during packaging to ensure that you receive the grade you ordered.

Well made reclaimed engineered wood flooring can have a face layer equivalent to solid wood and the same average length as solid. The dense reclaimed wood requires more attention to the details of the profile or balance of the milling.

15 - All of the antebellum plantations built along the Mississippi in the early 1800s were made entirely of old-growth Heart Cypress and are still toured today.

Settler's cabins across the South, Victorian mansions up the eastern seaboard and hotels and palaces all over Europe were built from the once vast old-growth Heart Pine ecosystem.

Then Redwood and Doug Fir supported the country's expansion as people moved westward.

One of your handouts will give guidelines on specifying: Oak, Beech, Cedar, Cherry, Chestnut, Doug Fir, Maple, Redwood, Heart Cypress, and White Pine, among other reclaimed species.

Men once girdled all the virgin growth heart cypress about waist high, 3-4' in depth in the late winter, so the tree could not take up water in the spring when it tried to put on leaves. If they didn't do this every last one of these millennium giants would sink to the bottom of the river.

16 - Antique Heart Pine is the most frequently specified reclaimed wood today. The caissons of the Brooklyn Bridge, Independence Hall and Jefferson's Monticello are just a few examples of Antique Heart Pine construction that has survived for centuries.

The problem with this beautiful wood, if there is one, is that there are no standards. Standards for Heart Pine were last published in 1924 and Heart Cypress in 1904.

17 - We worked with the Fish & Game and Water Management and EPA for over 12 years to develop an environmental permit process to ensure that everyone who pulls logs preserves the underwater habitat as he does. The logs off the river bottoms are rare, perfectly preserved and full of resin and life.

BEGIN RICH FOREST HISTORY – 10 MINUTES

18- According to the Forest Service logs were likely cut with a broad axe before 1885 as evidenced by the V-shaped or cone shaped bottom. The steam engine arrived down South about then and loggers switched to the two-man cross-cut saw or whipsaw instead of axes as they could load logs faster. Logs cut after the mid-1880's usually have a flat bottom instead of a V-shape.

19 - 150 years ago you couldn't go anywhere in the South without running into naval stores activity. White pine was running out up North and it was discovered that longleaf pine was harder and more durable. Longleaf pine was the reason the US was the world leader in naval stores until the middle of the twentieth century.

Men would scrape the bark every few weeks and collect the resin in barrels and taken to a still to make turpentine.

20 - The best pine logs grew right along the riverbanks behind the cypress swamps in the wetlands. These logs had to struggle more to grow in the mesic soils and they were often scraped for oleoresin to make turpentine, making the trees 'bulk' up in resin content. Often the densest and best logs were the ones that sank to the river bottom.

21 - As more people moved to the South, lumber companies had to take their crews further inland in search of more heart pine. Loggers dug manmade canals like this one shown near Tallahassee FL to bring inland logs to the river.

22 - The rafts were usually made with 15 logs across and two logs for cross members, about 20 sections long. The logs were drilled and fastened together with pegs, or blacksmiths fashioned

lash rings and the logs were tied together with the rings. Loggers often lived on the rafts for days or weeks on the trip to the sawmill.

23 - In the 1800s as America industrialized, it was heart pine that provided not only wood for homes, but also joists for the factories, timbers for bridges, warehouses, railroad cars and wharves. Even the tall ships shown here at this Fernandina, FL port and many others like it were all made of longleaf pine.

24 - Of the once 85 to 95 million acres, less than 5,000 acres of old-growth heart pine remain today. Longleaf was once the largest continuous ecosystem in North American.

There is a Federal Longleaf Program that pays up to 50% of the costs of restoring the ecosystems in its original range. Longleaf can be a superior producer if you have a 40-to 50 year rotation; however, the conditions for slow growth over hundreds of years probably will never exist again. The remaining river logs and beams are a limited supply of a rare and beautiful product

25 - The remaining longleaf virgin forests are still the most diverse on the North American continent. This plantation in Georgia has been documented to have over 60 species per square.

We recently provided heart pine for an 1865 train depot restoration. The architect needed historic material; however, not at the cost of reclaimed heart pine. The frequent lightning in the SE was what helped the longleaf ecosystem open so it can regenerate. Today when trees are damaged by lightning foresters take them out to prevent damage to surrounding trees. This was a source for historic material, not as dense as the antique wood, but it was painted anyhow, at a reduced cost.

26 - According to a dendrochronologist at LSU this log is over 225 years old. Many of the trees cut during the early part of the 20th century were 300, 400, or 500 years old. It might take up to 30 years for a tree to put on just one inch of girth. It seems true in our experience that often the densest and best logs were the ones that slipped loose and sank to the river bottoms.

27 – Some people ask how we dry out the river recovered logs. A tree is at fiber saturation point when it is growing, so the logs don't take on water in the river. If they aren't going to be sawn right away we store them in a pond at the sawmill to avoid the sun drying the outside of the logs.

BEGIN GRADING AND COMPARISONS – 10 MINUTES – Give out one page, two sided 'Terms Used to Grade Antique Heart Pine'.

28 - When the pine logs are sawn, there are three distinct grain patterns Vertical, Select, and Curly pine like in the bonnet of this corner cabinet

29 - Grain patterns often set reclaimed antique woods apart. Vertical grain requires larger logs or beams and wastes some wood to saw for it. 6" is wide for vertical grain

30 - Select is an arching or flame grain pattern that is sawn flat from the log and can achieve planks up to 8-10" wide.

31 - Curly grain is rare. 1 out of every 400 or 500 logs has a little bit on the outer boards.

An old forester who managed Greenwood Plantation for over 40 years told me no one knows what causes curly heart pine. It isn't a fungus like the Pecky Heart Cypress. He believes it is an inherited trait and says that whenever he finds a tree with bumps on the outside of tree that indicates curly grain he find more trees like that nearby.

32 - This partners desk was created by a designer in New Mexico in the George Nakashima style. You can see the natural river worn edges of the log in the desk top

33 - The trestle members show the wane of the tree and the feet show the ax marks from when the tree was originally felled.

34 - This California designer used craftsman columns and uses a few boards of a darker color heart pine to create a simply inlay in the River-Recoveredä floor.

35 - Heart Pine from pilings driven into the Savannah River when General Oglethorpe built the port in the early 1700's has a darker color than most Antique Heart Pine. He made small pilings from the center or pith of the tree and pounded them into the clay river bottom.

36 - Hemingway's Key West home needed a 'new' River-Recovered Vertical grain Heart Pine floor to replace the one that was damaged in a storm.

37 - Notice the rich red color and grain and mineral streaking. Wild Black Cherry grown locally to our sawmill has more figure and mineral streaking. It has to struggle to grow more in our hot and humid climate.

38 - Hand hewn beams and logs for columns add warmth to an ultra natural décor. These can take considerable labor to replicate in the sizes you need.

39 - Stair parts and molding to match any pattern are available. CAD has made molder knives much less costly to provide.

40 - Here's George Goodwin with some beams over 40 feet long and very rare today. Typically the factory joists and columns are 24' maximum. We recently had to provide long structural beams for a new town center called Brownwood at The Villages in Florida.

Remember these beams because I'm going to tell you a story at the end that an architect friend once told me.

41 - The heart pine floor shown here is in the newly restored Customs House in Key West. The restoration needed a few nail holes in the heart pine to match the rest of the historic building.

42 - There are several grades of 'character' that include larger knots and some sapwood and color variation, nail stain, bolt holes, cracks and checks. I love the embodied energy.. Everyone has different tastes in reclaimed wood.

43 - According to 'Longleaf Pine', a book published by the Forest Service in 1946, even a 200 year old longleaf will average only 2/3rds heartwood. The heartwood has from 7 – 21% resin content while the sapwood has only 1-3% resin content. Longleaf has more resin than any of the 200 species of pines and it is the resin that makes longleaf hard, durable, termite resistant and gives longleaf its rich, red color.

The owner wanted a log round scribed into the center of the library, so we soaked the round in PEG for two kiln charges to replace the water in the wood cells with the PEG. That caused the sapwood, which took the PEG more easily to darken more than the rest of the round.

44 –The USDA Forest Service gives us a definition for 'old-growth' per specie. The gist of it is that it's about half the age that you would expect the tree to live. Longleaf pine doesn't usually die of old age. It's tall and slender and has usually sustained injury from storms, lightning and hurricanes that kill it by the time it is a few hundred years old.

For Longleaf pine the age for true 'old-growth' is 200 years. For heart cypress it is 500 years, for white pine grown in the NE about 140 years, although the white pine was a much wider tree it was generally soft and not as durable.

Today Old Growth could mean a 40 year old longleaf pine. A 75 to 90 year old longleaf pine may have only 30 to 35% heartwood. These standing trees do not have the high-resin content of the original growth logs and do not offer the same patina and rich color.

45 - The sapwood of the longleaf pine is the lighter colored wood on the outer perimeter of the log. It does not deepen in color and is not as hard as the heartwood. It's still beautiful and a good economical choice. We call it Antique Longleaf. We don't call it heartpine unless it's mostly heartwood.

46 - - Quartersawn may not be all vertical grain.

- Wide planks are said to have 75% or 85% vertical grain due to the grain on the edges; however, they're actually plainsawn.
 - Kiln drying is essential for floors going into homes with modern heating and air conditioning systems. It's the only way to mitigate against moisture and insects.
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47 – There is a handout that gives you some terminology to use when specifying these characteristics. It's from a Hardwood Floors article that we'll send you.

48 - The 1924 standards required 6 growth rings per inch on average.

At least one-third of the wood should be in the darkest of the pair that make up a growth ring. Called late wood as it grew denser later in the growing season, the late wood contains most of the resin.

49 – You'll receive our Manufacturer's Guidelines as well as a sample Master Specification that will give you critical installation details for most installations. We are glad to help edit specifications to accommodate your site conditions. One of the papers you will receive is on the 5 ways to install solid wood over concrete along with tips for engineered or off grade installs .

50 - While a reclaimed wood floor may seem more costly given the expense involved in recovery and manufacturing, the floor can last for centuries.

Well-made engineered floors with a wear layer similar to solid wood may be a good fit for high-end asset management properties like this corporate office.

51 - Prices vary widely depending upon grade from less than \$5.00 to more than \$20.00 per square foot. They generally average \$8 or \$9 for the good grades.

BEGIN WOOD SCIENCE – 10 MINUTES

52 – We talk about wood science a little so we know how to avoid excessive wood shrink and swell. These problems are generally easy to avoid; however, it's surprising how few folks really understand wood and water. That's the name of an article you'll receive by our COO.

53 - Wood is composed mostly of very long vertical cells. The cells have "free" water inside them that goes away with kiln drying. The cellulose in the cell wall attracts 'bound' water and it's this moisture that causes the seasonal shrink/swell.

A surface finish slows down the moisture that wood can take on. You will want to consider a vapor retarder or underside treatment to prevent moisture intrusion under the wood floor.

Once wood is properly installed it's okay to be at the beach and open the windows and doors at night and turn on the AC in the day so long as you install the wood floor when the building is close to its ultimate RH and the MC in the wood floor matches the building RH.

54 - Solid wood shrink/swell varies with the grain orientation. Plain sawn with the arching grain pattern shows the largest increase/decrease with changes in RH. Vertical or quarter sawn shows about half the expansion or contraction of plain sawn. While no one knows exactly why this is so, there are about 8 theories, one involving the ray cells that cross the annual rings and extend outward like the spokes of a wheel.

Solid wood can shrink and swell 50 to 100 times more across the face than down the lengths of the board. Engineered wood cuts that shrink/swell by 5 times across the face; however, it lets the boards shrink and swell 5 times more down the length.

55 - Determine the building's average expected temperature and relative humidity range. Install when wood is at this moisture content and does not vary from board to board more than 1-2%. Use this chart from the Wood Engineering Handbook to determine a range.

Also make sure the subfloor is no more than 2% different from the wood floor. Expect the subfloor to be somewhat higher in moisture content if it is closer to the outside. The NWFPA used to say 4%. Today their guideline say if you floor is over 3" on the face it should be 2%.

56 –A couple who had bought from us 3 times before asked me to visit this site after the floor was delivered. The plywood was at 16%MC. We expected the wood to be at about 8-95 year round so the plywood needed to be no more than 10-11%. It was easy to dry out as it was Winter and we could turn the heat on. If it had been summer we would have had to turn the AC up and move the air with fans. The floor, of course, was now too dry. Remember this slide and I'll show you later how you can calculate how much wood will shrink or swell.

We brought the builder a proper vapor retarder as this was off grade. Roofing felt does nothing to stop the movement of moisture from underneath the wood floor. A bituminous layer between layers of paper, a product such as Aquabar "B" by Fortifibre, that has a permeance rating half way between roofing felt and plastic will slow moisture movement and reduce risk.

In situations where the construction schedule demands the floor go in over a wet subfloor you might use full towel glue with a vapor barrier and apply cheap polyurethane that you plan to sand off once construction is done on any floor installed that day.

57 - It's important to test with the right kind of concrete meter. We have a couple of the ASTM F2170 type concrete meters that give a true RH reading if you need to borrow one. You will receive a handout from the Portland Cement Association to understand the science behind this.

58 - Electrical resistance with handheld meters or with sensing pins or probes placed in contact with the concrete surface cannot assess moisture deep within the slab either. They only provide

useful data to a depth of 2 inches. They are simple and quick to use for troubleshooting and to help determine where to place quantitative moisture tests.

Calcium chloride test kits determine moisture in the upper two centimeters of the slab. Many other types of tests exist that measure the upper levels of the slab.

In situ probes that measure at least 40% into the depth of the slab are the only real tests that indicate whether the slab is ready to be covered over with flooring.

When our business valuator called me over to look at a video of the irrigation system punching a hole in the soffit and flooding the kitchen we found that the restoration company had taken up part of the engineered floor and used dehumidification for 3 days. We used an impact drill with a 7/16" bit on the slab, cleaned out the dust and let the heat dissipate and found a reading of 89% versus the 75% that the NWFA says is the highest it should be to install wood floor.

We dried out the site over a month with AC. If there had been a time constraint we could have used a system like Bone Dry's enzyme that is spraying over the concrete and fills the voids to let you install right away. Watch out for concrete that has a surfactant added to help the screed crews not have to work overtime. If a drop of water beads up you may have to abrade the concrete to get good glue adhesion.

59 - Solid wood directly on concrete requires more craftsmanship. We brought up a craftsman with the experience of gluing solid wood to show the local installer on this job.

We used the Sika glue down system that includes a mat to meet the sound transmission class ratings.

With any sound attenuation it's important to seal the perimeters and not put nails through the sound mat. Also put the sound product into the expansion space and a little up the walls around the room to maintain the sound control.

There are a variety of proprietary systems. Some still use cork as the sound layer. Whatever you use, remember to use the same strength glue for the sound layer as you do for the wood layer to prevent voids in the system. Bostik and others make good elastomeric glues with acceptable levels of VOCs.

60 - The floor cleat at the top is flat on the bottom and shears the fibers instead of splitting them like staples may do.

Advantech does not hold nails well enough over time. Try nailing a piece of floor to Advantech and one to plywood and see which you can pull off. We specify every other trowel width of glue if going over Advantech.

A floating floor can have distinct disadvantages if the floor gets wet. We learned after a flood that in second story and up condos that it will dry out from underneath if the floating subfloor is plywood and not felt cloth.

61 - Solid wood will acclimate to any condition accounted for during installation and you don't expect huge changes. In the islands with 75% RH if the wood goes in at 14% it's fine, or in the mid-west if solid wood goes in at 6% it's fine.

What most people don't know about engineered wood floors is that they only perform well within +/- 2% of the MC at which they were manufactured. We acclimate for the area where we are shipping and mill with at least 4 plies above the tongue and groove.

If you want a wear layer equivalent to solid wood you'll want to put more plies under the face than in the example at the top. Reclaimed wood is strong and can make this floor dry cup in Winter. The bottom example uses a different specie with lower strength on the bottom and can have similar issues.

BEGIN FINISHES – 5 MINUTES

62 - Wood floor finishes are complex chemicals that require someone who applies them regularly to get a good result. Whenever someone asks what finish to use we jokingly say, "The one your finisher knows how to use." You can accomplish a myriad of looks with different finishes.

This floor is Wild Black Cherry. Remember the wild grain and streaking in the cherry floor some slides back. This owner wanted her Cherry to be a brownish color more so on the first floor. The finisher used an Ammonia wash, often used to obtain what is called a fumed finish on oak. It requires a lot more skill in application and the same look could have been achieved with one of the newer European Penetrating Hardening Oils that come in dozens of colors.

63 - This owner wanted an oil finish for matt sheen and more consistent color and less color variation.

They also saved time and got the more consistent color as well by 'racking' out the boards before they started to install.

I love looking at 1,000 year old heart cypress. It makes me feel younger.

64 - The architect for this restaurant wanted to see some color variation between boards and a lighter shade on the wall for contrast so used a water based polyurethane.

One of the handouts is 'Which Finish Should You Use on Reclaimed Wood.'

The log reception desk required surface heat treatment, as well as some solvents to remove some surface oils and finished with polyurethane to seal the log. A boat builder from Charleston came to Goodwin, hand picked and carved it before finishing.

65 - This is an ultra contemporary office building where the owners wanted the floor to contrast and look old, yet they wanted the color to be the blue to match their cabinetry.

We used 3 parts black with one part colonial blue PPG oil stain followed by a light wash of 8 parts water one part black wiped on and off immediately, two coats of water based polyurethane went on top.

The floor was fine for four years, except for the ladies little high heels. When the owners called us in we asked the cleaning crew and they swore they didn't use water we caught them with a 5 gallon bucket at midnight. The cleaner they used had degraded the finish.

We bought them terry cloth mop heads to go over the rectangular mops and the spray cleaner made specifically for wood floor. After some touch up restaining and a 'screen and recoat' for \$1 a square foot with the hardest available commercial finish the floor should need no more maintenance for years to come.

66 - This National Wood Floor Winner of 1998 was hand-scraped instead of sanded to give the wood more texture and light. A handscraped and oiled wood floor can hide minor blemishes or scrapes, though it can also present more challenges to maintain and refinish.

BEGIN CASE STUDIES – 5 MINUTES

67 - A special competitive price was requested for building salvaged antique heart pine flooring, all 7' and longer with no further stated specifications.

Once the flooring was ordered additional specifications were made:

- Center match milling—non standard (milled wood that did not meet the grade would not be as saleable without a standard flooring match)
- 'Clear', absolutely no knots (much more difficult in building reclaimed)
- No nail holes, yet building salvage has considerable nail holes
- Custom 3" face (3-1/4" face is standard from a 4" board, an 8 percent loss)
- No resinous boards as the finisher thought these would be more challenging to stain.

The manufacturer provided the full specs at the original quote, though at considerable losses. Any order of reclaimed or antique wood needs a thorough investigation of the client's expectation. Particularly historic restoration needs need a quotation process that includes:

- team review of all quotations,
- customer signoff including detailed specifications of orders, and
- A detailed checklist of grade questions including: Color matching, Grain matching, Resin content, Knot size, Lengths, Growth rings, Face width, Milling patterns, and finishing plans.

68 - After a toilet overflowed on the second floor, a restoration services contractor was called in to dry out the site with dehumidification. The wood floor was installed at 8-9% and was nailed directly to the original heart pine joists with no vapor retarder. The antique wood joists were not dry and two to three months later, after the Winter heating season, the wood floor began to cup in the Spring.

A pin type meter was required as antique heart pine or any resinous wood can generate erroneous readings with a pin less meter. Pin less meters measure specific gravity rather than resistance and the specific gravity of resinous wood varies. We used 16 penny nails inserted 1/4" at a time close together and touched the pins of the meter to the nails to read the MC deeper than the pins would go. We would have needed insulated nails if we expected the MC to go down as we went deeper.

Measurements at successive ¼” depths showed 11% at the top of the wood floor and 20% into the joists in the upstairs floor that was replaced. Measurements in other parts of the house showed 12% at the top and 14% at the bottom.

The wood floor had been installed at too low a moisture content and the joists were still wet.

- A few floor boards were removed and the finish was abraded to let fans and dehumidification remove the excess moisture in the joists. The air conditioning system was repaired and relief joints were cut into the floor once it was at the ultimate moisture content for the home.
 - The restoration contractor modified drying procedures for dense antique wood.
 - The flooring installer learned proper moisture measurement procedures.
 - Both contractors learned proper acclimation with moisture measurement, not time.
 - Vapor retarders in ‘wet’ situations were explained to all trades.
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69 – This is our favorite fact about wood floors to teach architects and designers. You can tell how much a wood floor is going to shrink or swell before installation. Or you can use this formula to aid in determining the source of a problem with shrinking or swelling.

The maximum shrink/swell according to the Wood Handbook is 7.5% for plain sawn antique longleaf pine and the maximum fiber saturation is 25.5%. Note that red oak, actually pin oak, one of the more commonly occurring of the 19 or so species found in red oak, shrinks and swells 30% more than antique heart pine.

This formula told us that the wood was going to expand almost 1/16 of an inch when it reacclimated to its eventual moisture content. In the 20 foot wide living room it would have pushed the walls off the foundation.

We bought a bag of washers and showed the flooring installers how to stand the washers up over the tongue every second or third row to leave a gap that would close up as the wood acclimated.

70 – Here’s George with some antique heart pine and heart cypress. Reclaimed wood offers a tremendous diversity in designs.

71 - Hear a little of what an architect has to say about reclaimed wood.

I told you I’d tell you a story about special long beams... When I first met Gail at a green building conference she told a story about being in England around a conference table in an old castle. The design team was trying to figure out how to secure a large, very long beam to repair the castle. The budget didn’t allow for the extensive transport that was going to be required. When the forester overheard the conversation he said, “The architect planted some of these trees in the forest when he built this castle 200 years ago for this very purpose. I can show you where they are.” So architects do think long term!

72 – References On Screen

Handouts to be Emailed After the Presentation

- Antique Heart Pine Defined – Hardwood Floors Magazine
- Beauty Of Engineered Wood

- Can I Install Wood Over Concrete
- Concrete Floors And Moisture
- NWFA Problems, Causes and Cures
- Manufacturer's Guidelines by Goodwin
- Reclaimed Wood Council Guidelines
- Under The Microscope, Wood And Moisture
- Which Finish To Use On Reclaimed Wood
- Master Specification Example for CSI Section 09640 – Wood Flooring
- Copy of the Slides and Handout for the Presentation