

## **Amtico “Teak & Holly” with pre-fab’d panels using mass loaded vinyl soundproofing**

This article documents the steps we used to install Amtico “teak & holly” vinyl strip flooring in the salon/galley and wheelhouse of our 2001 37’ Nordic Tug working around the custom galley and wheelhouse cabinetry. “Sole” is the marine term we use through this article for the deck/floor/plywood subflooring of the surface in the wheelhouse and salon/galley on which you will typically stand. Not covered in this article is dealing with installing solid teak/sapelle stair treads and ¼ teak ply kick panels on both sets of stairs or the solid teak/sapelle transition to the stairs.

### **Preparation**

1. Carefully removed all NT’s teak baseboard quarter round trim.
2. Removed all the carpeting and glued down backing pad including around the hatch frames. Scraped up the carpet adhesive residue – very nasty job. Removed all the staples.
3. Removed all the doors and drawers that would be in the way of inserting the pre-fab’d laminated panels.
4. Very carefully removed all the NT teak corner moldings from the cabinetry – ours were just nailed from both sides, no adhesive like so many other things we’ve tried to remove on the boat. We carefully slipped clean 3” metal putty knives into the joints from both sides without scratching anything and, starting at one end, gently pried the molding away from both cabinet surfaces at the same time without leaving any visible dents, then sliding to the next set of nails; damage was minimal, a few easily repaired cracks.
5. We trimmed up an additional 1/8 - 3/16” on all the vertical teak molding which could not be removed (i.e., teak “U” moldings for the stair rail panel and galley stove panel) required to provide clearance for the pre-fab’d panels to just slip underneath. Used flush-cut Japanese saw which have teeth set only on one side and a guide on the sole.
6. Edges of carpeted hatch openings were not perfectly square or perpendicular. Squared up the hatch openings of the sole using top bearing “pattern” style router bit running on fences (white strips in image) temporarily nailed to the sole. Inserted temporary panels (brown panel in image) in the hatch openings precisely raised on threaded ‘feet’ to be exactly level with the adjacent temporary fences. This allowed the router to be fully supported and perpendicular to the sole. Trimmed ~3/32” as required, from all 4 edges of the hatch opening in the sole to make openings perfectly rectangular and clean. Had to remove NT installed hardware within the cut zone. Squared rounded corners left from the router bit radius by hand with chisels.
7. Squared up the plywood edges of the engine room and salon hatches on table saw. Left enough hatch plywood to result in a precise 3/4” gap on all sides to the trimmed hatch openings for installation of later teak edge trim to be applied to both the sole and hatch sides of the gap. Goal was to leave as large an overhanging lip on the hatches as possible to avoid accidentally dropping them through later if initially positioned slightly askew.



8. Lined the vertical hatch opening, and all edges of hatch, with 1/16" strips of hardwood. This turned out to be a critical step because the plywood laminated edges of the sole hatch were not stout enough to provide the critical reference for the bottom-bearing flush trim router bit used later to cut out the hatch openings from the finished panels. Resulting gap after installing the hardwood strips was 5/8" (2 x 5/16" teak/sapelle finish trim strips later).
9. Leveled the trimmed/square hatches to the adjacent sole. This is critical and quite time consuming step both for getting a good uniform glue joint of the panels to the hatch and adjacent sole and having flush hatches.
10. Inserted soft wood spacers around leveled hatches to perfectly center them in their openings. Spacers were low enough in height to allow the bottom bearing router trim bit to pass over them when cutting the hatches out of the finished Amtico panels.
11. Soles were not uniformly flat. Filled in the significant low spots in the sole with standard vinyl flooring feathering compound (had 2 significant spots to fill on our boat, the aft-port corner of the wheelhouse at the top of the salon stairs and at the interior threshold of cockpit door into the salon/galley). Belt sanded the high spots. We had lots of variation across entire spans that were well hidden under the carpeting of both the wheelhouse and salon/galley. We ended up going for 'pretty darned flat' across any 2' section of sole. The prefabbed panels effectively flexed to make up the difference (for which we wished we would have put down more adhesive for the final panel install as noted later)
12. Established and marked precise center lines on the clean plywood sole based on the centers of the hatches properly spaced in their openings.
13. Made precise paper patterns of the wheelhouse and salon-galley soles accurate to +/- 1/32" (kraft paper paint drop cloths from Home Depot with the edges reinforced with blue painters tape).



### Pre-fabbing the panels

14. The structural cores of the pre-fabbed panels were a pair of 5'x5' 1/4" plywood sheets (5-ply, no gaps, Crosscut Hardwood / Seattle) for the wheelhouse, and pair of 4'x8' sheets of the same 1/4" plywood for the salon/galley.
15. Chose to layout the new sole pattern with a 1/4" "holly" Amtico strip as the visual centerline down the middle of the hatches and lift latches and the teak/sapelle hatch frame trim would then run down the middle of a 3" "teak" Amtico strip (note, NT uses 2.5" wide "teak" Amtico strips).
16. The joint between the pairs of prefabbed panel was designed to intentionally be off the actual centerline under one of the fore-aft 3" "teak" Amtico strips.
17. Cut the intricate 1/4" plywood panels using a router



referenced off a clamped fence for every straight cut – made for extremely accurate straight square, splinter free edges (there is a lot of precise handling of these heavy panels later). Using a saber saw would have left a nasty splintered edge.

18. Cut the panels to have a  $\sim 1/8''$  gap around all panel edges that would be hidden by the teak quarter round baseboard molding. Yes, this left space for possible water intrusion / deterioration but you can caulk it if you care to.
19. Carefully transferred and marked all lines along the central fore-aft panel joints required to align panels later to the boat's marked centerline and hatch joints.
20. The matched pairs of plywood panels in the salon/galley required several small rectangular cut-outs to accommodate installing the panels around the various non-removable interior features, i.e., sliding under the galley cabinet toe-kick, various finished teak bulkheads at the bottom of the salon/wheelhouse stairs and next to the galley stove. Also required was clearance to drop the salon panels in over the bottom salon/wheelhouse stair tread. And the unfortunate reality that the salon/galley sole is 8'6" long and the plywood is only 8', so there was a fill-in panel to stretch it as well. All but one of these 'fill-in' cut-outs were less than 1 square foot.



21. We did many trial installs of finished plywood panels to perfect the cut-outs and finalize all details of the in-boat installation considering wet adhesive would be in place everywhere on the NT plywood sole that we also needed to be standing on to do the final install.

22. Laminate stack, top to bottom:

- 1/8" of Amtico
- 1/4" 5-ply premium plywood
- 1/8" mass loaded vinyl sound proofing

23. Mass loaded Vinyl (MLV) was bonded to the back- side of the cut-out plywood panels. MLV soundproofing is quite heavy: 1# / sqr-ft. NT installed our original carpeting with a backing pad that contained a thin MLV layer.



To the best of our knowledge, new NT's delivered with Amtico, have the strips bonded directly to the plywood sole without additional soundproofing. We thought adding the weight was worth it because reducing engine noise was a secondary goal.

24. Our 15 year old teak paneled cabinetry had faded a lot. The areas under the quarter-round base molding, installed at the carpet/backing height, uncovered a significant color difference. The finished height of the MLV/plywood/Amtico laminate stack-up fit nearly perfectly under the original base molding height thereby avoiding re-finishing all the teak on the sides of the cabinetry. Probably could have worked out the same without MLV and 3/8" plywood.
25. Held the MLV about 1/16" back from the joint so that only the wood edges of the plywood were the only mating surface at the main joint between the matched panels.
26. Except for the big cut-outs, we left the MLV layer extending beyond the plywood core into the cut-outs space as flaps to simplify install on the boat.

27. Applied glue to the MLV and aligned the plywood on top; rolled the wet glued lamination corner to corner with rented 100# flooring roller to eliminate entrapped air bubbles just like for a standard vinyl kitchen floor install.
28. Aligned and temporarily attached the matched pairs of panels to a flat work surface exactly aligned at the final joint – tacked both panels to the work surface along the joint within 1” of the joint edges (this is a glue keep-out area as that Amtico strip is install on the boat afterwards).

29. Did a trial Amtico lay-out with no adhesive. Trimmed partial Amtico strips as necessary marking all cut ends because the finished butt ends of the Amtico strips are factory-beveled. We used big tin snips since all the cut ends would be covered by the NT baseboard molding.



30. The teak Amtico strips have quite a color range and pattern variety with no discernable pattern repeats. Worked out well to randomly mix the color range as well as staggering the butt joints, had enough extra that probably could have high-graded for a darker color but probably not the lighter ones without an extra case of vinyl strips. The slightly spectrally reflective surface of the Amtico resulted in a ‘brighter’ boat interior even though the color of the Amtico was darker than the carpeting.

31. In all the cut-out areas (required to slide finished panels into place on the boat), we “gap toothed” the adjacent Amtico strips beyond the cut-out with 2-12” random set-backs from the cut-out edges so that, after the panels were in place on the boat, we could finish the install by gluing in small square plywood filler pieces, then carefully glue in the short Amtico strips to fill into the gaps. All the “gap-tooth” areas on the plywood were marked as adhesive keep-out zones on the panels before we installed the field of Amtico. Perfect alignment of the matched pairs of plywood panels was maintained by tacking the sheets down to a working surface using the cut-out/no Amtico “gap tooth” areas to nail thru.



32. We laid the Amtico field strips from the middle (panel joint) out, so the first strip of Amtico teak covers the central joint between the pre-fab panels. This first strip was “sacrificial” so it was installed dry without adhesive tacked down with short nails so that we could separate the panels later. This central Amtico strip is a boat-installed strip after the pre-fab’d panels are completely installed.
33. Three of us worked the Amtico strip install as a team: adhesive, material handling, and install. All the strips were pre-cut, tested for color and random end-edges and then stacked in order for the material handler to coordinate, the wet adhesive was installed in 3-5 square feet sections ahead of the installer. We were religious about vacuum cleaning everything from the panels to the fronts and backs of every pre-cut strip. We marked every Amtico end we cut with the tin snips so that the factory chamfered ends were the only butt joints throughout the field and the tin-snipped ends only ended up at the edges.

34. Avoid having too much adhesive under the pair of 1/4" "holly" strips adjacent to the dry-installed central strip - these narrow strips will also be installed on the boat along with the central teak strip that covers the panel joint.
35. Rolled entire 'wet' Amtico in adhesive with the rented 3-part 100# flooring roller to eliminate air gaps and establish uniform heights of all the Amtico strips. It was fairly easy to clean afterwards. We prepared with lots of clean water damp rags to deal with adhesive squeeze out to minimize transferring it everywhere with the roller.
36. While majority of adhesive was still 'wet', we carefully removed the central dry-installed central teak Amtico strip covering the joint between the panels along with the adjacent 1/4" holly strips before the adhesive cured, then scraped any residual un-cured adhesive from this area of the plywood panels. This adhesive is remarkably tough, get to it quick.
37. This approach to install the holly-teak-holly central strips actually worked out great, the joints on these last boat-installed Amtico were as snug tight as if we'd laid them first.

### Adhesive

38. We used the same one-part Mannington V82 air-cure adhesive that NT uses for their factory installed Amtico soles. The Amtico supplier we found strongly recommended a different 2-part Mannington adhesive designed for marine applications – that 2-part adhesive was not a 50:50 mix so challenges of getting the working pot volume right along with all the nasty clean-up issues associated with using an epoxy suitable solvent (naptha) would have been awful. As it was, we had a lot of adhesive spills and drips with the air-cure version along with lots of sticky fingers to deal with; we found the V82 clean-up easy to stay on top of throughout the install.
39. The Mannington V82 adhesive 30 minute working time worked out fine as long as we were careful not to layout entire panels of adhesive at a time, it is near odor-less and the claimed clean-up with water while wet was a bit of a stretch, but clean-up with paint thinner worked very well, even when near-dry.
40. The recommended tiny-toothed trowel required by Mannington/Amtico to apply the adhesive was challenging to find ([www.krafttool.com](http://www.krafttool.com) model ST405PF 11"x4.5" notched trowel, bought on Amazon). The notch was so small it appeared to leave almost no adhesive but tests went quite well and even resulted in a tiny bit of uniform squeeze out when using a 100# flooring roller so we used it with confidence.
41. We were fairly surprised we only used 95% of a single 1-gallon tub of adhesive for all 3 adhesive layers (plywood-to-MLV + Amtico-to-plywood, along with the bonding of the finished laminated panels to the sole in the boat) for the salon and wheelhouse soles. But glad we had an extra gallon tub standing by.

### Panel Installation

42. Trial fitting the pairs of fully laminated panels several times working out final details like where exactly to trim the wheelhouse panel edges at the tops the stairs and all other possible fit and clearance issues.
43. Installation order – we started with the one pre-fab panel of the pair marked to align with the marked centerline of the sole. We used same Mannington adhesive to attach the laminated



panels to the sole, and nailed the panel to sole everywhere panel's plywood core was still exposed (along central fore-aft joint and various exposed cut-outs).

44. Before installing second of the panel pairs, we drilled a 1/2" hole thru the first panel into the 5/8" hatch gap. This provides access to route out the hatches from the panels later.
45. Glued in all the small 1/4" plywood sections to fill in the cut-out areas on top of the MLV flaps and smoothed all plywood transitions so there was nothing to show thru the Amtico later.
46. Glued in the central "teak" Amtico strips and pair of 1/4" "holly" strips covering panel joints – this worked far better than we were expecting, the install was tight and not discernable.
47. Glued in all the short Amtico "gap-tooth" strips covering the cut-out areas (required to accommodate the fixed interior obstructions).
48. Rolled the boat-installed Amtico strips aggressively with small laminate hand-rollers, it was too tight to use the 100# roller.
49. Cut hatches out of the finished panels using bottom bearing router trim-bit accessed by the carefully drilled 1/2" hole into the hatch gaps. The 1/16" hardwood strips lining both edges of the hatch gap between the sole and the hatches was really important to maintain a good straight routed edge at this stage - the plywood edges of the sole and hatches are not sturdy or tough enough to run a bearing router bit onto and still expect to get perfectly straight cuts. These are big cuts for little trim bits, we learned to allow the router to find its own path then "work" the finished edges on subsequent passes.
50. Cut the pockets for the hatch latches in the Amtico surface of the hatches using a 2-part shop-made router template.
51. Trimmed the hatches and hatch frames in 5/16" sapelle (NT uses sapelle today instead of teak in a lot of the newer boats because it's less than a third the cost and virtually indistinguishable, teak is a little oilier and the sapelle a little darker after oiling). This seemingly "small" job took nearly a week of effort. Having a well tuned power wood planer on the dock was critical because few of the pieces needed to be 'perfectly' less 5/16".
52. Installed the top stair transitions fabricated from 2" sapelle (we also replaced the carpeting on both sets of stairs with solid Sapelle for all the treads and teak-ply for the risers).
53. Re-installed all the baseboard molding, corner molding, and the doors/drawers.



## Observations

1. We certainly could have avoided the pre-fab'd panel approach and installed all the Amtico laminate strip by strip in place on the boat on our hands and knees. When NT does an Amtico sole, they do it just this way but they install it on a wide open sole before any of the cabinetry is installed. NT also cuts their hatches out of the finished Amtico sole like we did.
2. The pre-fab'd panels were heavy but remarkably sturdy to transport - heaviest panel was approx. 90# for the one on the galley side of salon. Panels were flexible but did not appear to impact the integrity of the lamination during transport and install, would have been half the weight if the MLV were installed separately but don't know if the single sided plywood-Amtico lamination would have been stiff/strong enough on its own).

3. Install of the panels in the boat required 2 strong people who communicated well and had pre-agreed on the plan.
4. A direct install of the Amtico strips directly to a properly prepped boat sole would have avoided most of the carefully designed prefab panels with all the cut-out hassle required to “slide” the panels into place. A direct install could have the fresh plywood layer installed in quarters using an additional port-starboard edge joint as well as the fore-aft edge joint approach we used with the 2 panel approach. You would still have to deal with figuring out how to install Amtico strips under the cabinet toe-kicks as well as carefully fitting all the precision edge pieces in all the other the restricted spaces when everything is being set in wet adhesive with the 30-minute clock running.
5. Cutting out the hatches from a finished lamination insured the Amtico strips lined up perfectly across the hatch frames. An absolutely mandatory tool to cut hatches out of the laminate after installation is an “offset trim router”. We would not have been able to cut the engine room hatches out using a full sized router, or even a standard trim router, because of how close adjacent cabinetry is to the hatch frame. NT doesn’t have this problem because they do all the hard work before the cabinets are installed. We were able to rent a little gear-driven off-set router. Trim routers with accessory belt-driven off-set bases are available for purchase but are designed to ‘trim’ laminate and may not be able to transfer enough HP to cut thru the entire laminate stack at once.
6. We certainly could have applied the Amtico directly to the original NT sole after a lot of leveling and sanding but Amtico is really pliable. It’s known to eventually conform to, and show, every hidden defect and discontinuity in the surface below. All Amtico installers we spoke to including NT strongly recommended starting with a new, absolutely smooth surface to bond the Amtico to.
7. The deciding factor for the height of our laminate stack-up was not wanting to deal with the fade mark on the teak cabinetry paneling where the carpet high baseboard has been attached for 15 years. The additional sound proofing layer of MLV over what NT does today with Amtico soles was a remarkably wonderful enhancement, we can now play music at a normal level and have a normal conversation in the wheelhouse running at 7-8 knot / 1200-1400 rpm hull speed.
8. Regardless of how you do the install, it is not possible to spend too much time and effort squaring up and leveling the hatches before you start – prefab’d panel or direct install. It’s pretty clear the fit and finish of our boat’s sole was intended to be carpeted. Once everything was exposed, nothing was actually square or level because everything was all hidden by the carpeting and its backing.
9. When trimming the hatch edges to square them up, keep in mind that you want to end up with as much of an overhanging lip as possible so that you can’t accidentally drop a skewed hatch thru the opening into the bilge below.
10. We didn’t weigh the carpet and padding that we removed but we figure we added at least 100-150# to the boat. The hatches certainly got a lot heavier. So we flipped the flush mount hatch latches around so the loops don’t pinch fingers while lifting and moving the hatches aside.



### **What we would have done differently**

1. Could have spent even more time than we did leveling the hatches before installing the pre-fab panels. Would have been nice had they been truly perfect before we glued down the panels.
2. We would not have used the tiny-toothed Amtico adhesive trowel to layout the adhesive to bond the pre-fab panels to the original sole surface. Because the original sole surface was not perfectly flat, a standard vinyl flooring adhesive notch (about 2x larger area than the Amtico trowel) would have worked a lot better laying down more adhesive between the pre-fab'd panels and the original sole & hatches. The tiny notched trowel that left a near perfect amount of adhesive to laminate the Amtico strips to a perfectly flat surface resulted in a few air gaps in the adhesive joint around the hatch frame that we found after the hatches were routed out. We had to carefully fill-in these gaps before installing the final hatch edge trim.
3. Investigating if it was possible to pre-seal the Sapelle in some way so that it didn't end up being as dark as it did after the five coats of teak oil. The resulting dark color was fine for the narrow hatch frames but turned out to be pretty dark for the new stair treads we fabricated from solid Sapelle.

### **Things which were crucial to success**

1. Finding high quality 5-ply 1/4" 5'x5' plywood at Crosscut Hardwoods in Seattle (and Portland) for the pair of wheelhouse panels.
2. Finding the gear driven Makita model 3705 offset trim router to cut out the engine room hatches from the finished wheelhouse sole around the tight cabinetry. (Aurora Rents – Seattle).
3. Remembering to drill the 1/2" access holes into the hatch opening gaps (for initiating the routing out of the hatches from the finished sole) when only one of the pairs of panels was installed so we absolutely positively hit the hatch gap underneath.
4. Having 5/8" spacers centering the hatches in their openings that were low enough to allow the bearing of the trim router bit to clear the spacers while cutting the entire laminate stack and test driving this to make sure it worked.
5. Being extremely comfortable using a router under fairly challenging circumstances.
6. Having 3 people for the pre-fab lamination stage and having 2 capable people to safely transport, lift, handle and install the heavy panels over wet adhesive, and who have already practiced the actual insertion several times and still be able to communicate well under adhesive open-time pressure.
7. Having a precision chop saw in the cockpit and a high quality wood planer on the dock for final fitting all the tedious hatch trim.

### **Total Cost**

1. Less than \$2K DIY out-of-pocket for everything. (~\$800 for Amtico, ~\$350 for the MLV, ~\$100 for adhesive, ~\$100 for Sapelle, ~\$100 for the plywood, ~\$125 tool rental, ~\$75 router bits, ~\$100 misc)
2. Didn't keep track of time but it ended up being several months of "more than occasional free time" totaling at least 200 hours including all the 'pondering' time to work out a lot of the details described here – clearly at least a \$8-10K job if done professionally and expecting near perfect fit and finish with flush hatches.