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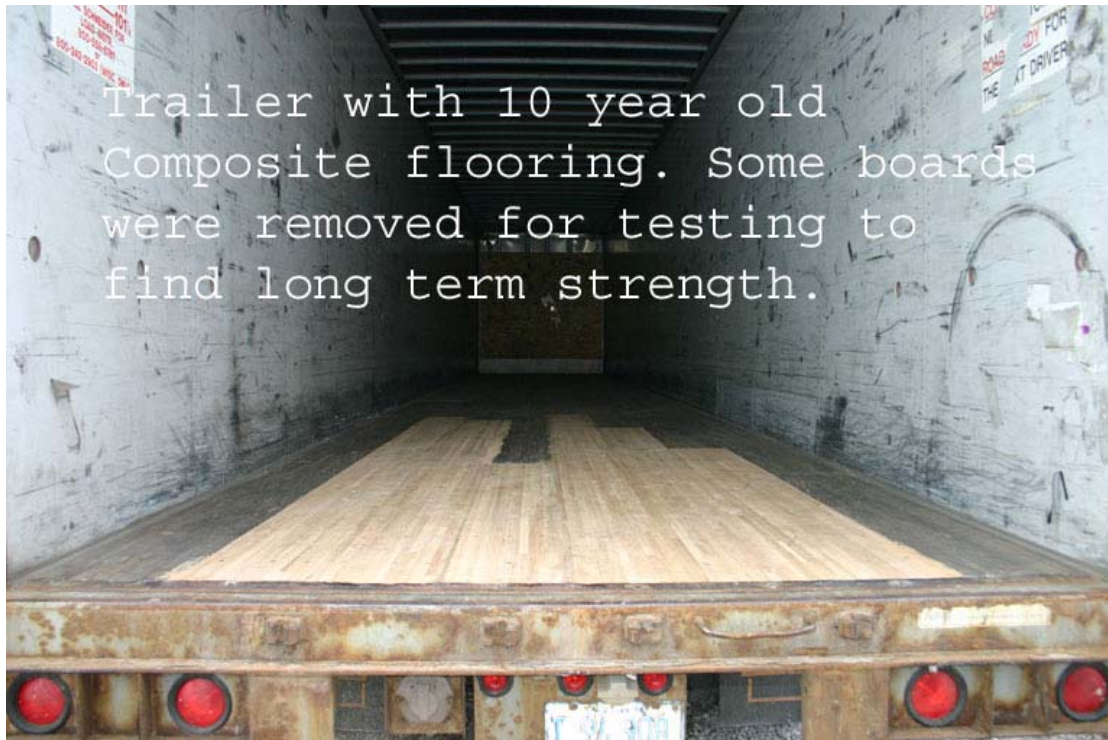
Part 2: Strength of 10 Year Old Composite Oak Flooring

(Testing of first field test kit made by Havco Wood Products)

Location:	Havco Wood Products, Scott City, MO 63780
Reported by:	Gopal Padmanabhan (Engineer, Havco Wood Products)
Date:	April 7, 2005

Purpose

To determine the residual strength of composite flooring after 10 year service.



10 Year Old Composite Flooring

Flooring of trailer # A442130 (Schneider National) was previously inspected at the Dallas maintenance facility. This trailer had a manufacturing date of February 24, 1995. The trailer flooring was identified as Havco composite (Version-Field test kit). Floor was composed of 20 foot long or shorter sections of composite boards. These boards were butted together at the ends of boards to span the length of the floor. Based on the date and construction of flooring, this floor kit was identified as the first composite oak flooring ever made for field testing by Havco Wood Products.

This trailer was brought over to Havco's factory in Missouri in March 2005. The floor was 10 years old at the time of this inspection and testing. Several boards in the rear section of trailer were removed for inspection and testing. The thickness of the flooring was 1 3/16", with a nominal thickness of fiberglass of 1/16".

Industry Standard Bend Testing





The industry standard bend test requires the application of bending load at an edge of floorboard supported at 30 inch span. A hard rubber block with a foot print of 3"x4" is used to transfer the load. This test is normally used to check the production quality of glue bonds between wood components that make up the floorboard. The average failure load obtained from this test is a measure of the load carrying ability of the flooring.

Based on this test, the 1 3/16" composite floorboard showed a 22% loss of strength after 10 years of service compared to its original strength. Specifically, the residual average failure load was 6166 lbs compared to 7883 lbs for the original virgin floorboard. A 1 5/16" standard oak floorboard has an average strength of 5100 lbs in new condition. It is clear that the 10 year old 1 3/16" composite floorboard is about 20% stronger than new standard oak floorboards.

A 1 3/16" Havco Composite floorboard (current production model), has a strength of about 9000 lbs in new condition. This flooring is stronger than the 1 3/16" composite floorboard that has been field tested for 10 years. Therefore, the current Havco Composite flooring is expected to perform better than the field tested composite flooring.

3 Point Bend Testing

This test is conducted to determine the material strength and stiffness factor (modulus) of flooring. Results show that the 10 year old composite flooring is stronger than new standard oak flooring.



Flooring Type	Strength (psi)	Modulus (million psi)
1 3/16" Composite (New test boards before road service)	20,964	1.97
1 3/16" Composite (After road service for 10 years)	16,234	1.64
1 5/16" Standard Oak (New)	13,000	1.65
1 3/16" Havco Composite (New)	24,000	2.1



3 Point bend testing of 10 year old composite floorboard.

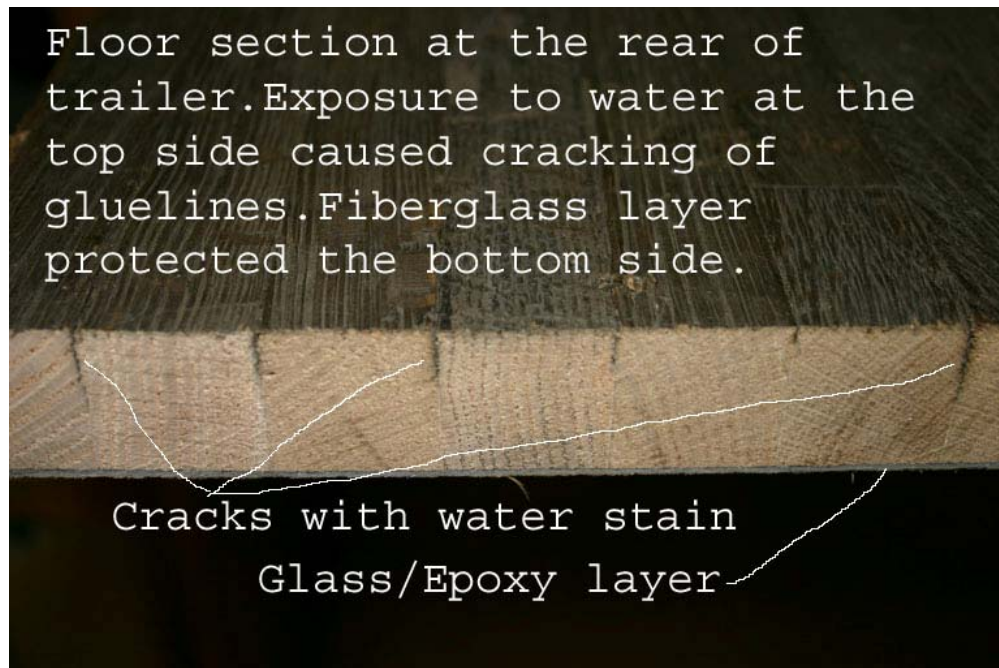


Cross-section of 10 year old composite floorboard shows good bonding of fiberglass layer to oak.

Effect of Water

Wood flooring can get wet in service due to various reasons. In general, wetting and consequent drying of floorboards leads to degradation of gluebonds. In a composite floor, the floorboards are protected at the bottom side. However, the top side of the flooring can get wet near the doors of the trailer.

Cross-sections of the 10 year old composite floorboards were examined to determine the effects of water. At the rear section of flooring near the doors, the gluebonds between wood components showed cracks at the top side of flooring. However, the bottom side was not affected by water. At cross-sections away from the doors, the composite floorboards were in good condition.



Summary

The fiberglass layer not only strengthens the floorboards, it also protects the gluebonds and wood from water at the bottom side of flooring. Both the high strength and protection derived from the fiberglass layer improve the service life of flooring.